

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 1-10								
		<input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2014 Title of Work Assignment/SF Site Name Climate Change & TMDL Pilot								
Contractor TETRA TECH, INC.		Specify Section and paragraph of Contract SOW 2g								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Period of Performance From 09/30/2013 To 09/29/2014								
Comments:										
<div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund </div>										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		LOE:						
09/30/2012 To 09/29/2014										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:				Cost/Fee:		LOE:				
Cumulative Approved:				Cost/Fee:		LOE:				
Work Assignment Manager Name Steve Klein						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number 541-754-4858				
						FAX Number:				
Project Officer Name Sharon Boyde						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number: 703-347-8576				
						FAX Number: 703-374-8696				
Other Agency Official Name						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number:				
						FAX Number:				
Contracting Official Name Mark Cranley						Branch/Mail Code: CPoD				
_____ (Signature)						_____ (Date)				
						Phone Number: 513-487-2351				
						FAX Number: 513-487-2109				

PERFORMANCE WORK STATEMENT

Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 1-10

TITLE: EPA Region 10 Climate Change and TMDL Pilot

PERIOD OF PERFORMANCE: Award date through September 29, 2014

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INTRODUCTION

Global climate change affects the fundamental drivers of the hydrological cycle. Evidence is growing that climate change will have significant ramifications for the nation's freshwater ecosystems, as deviations in atmospheric temperature and precipitation patterns are more frequently recorded across the United States (Bates et al. 2008; Karl et al. 2009). For example, stream temperature is projected to increase in most rivers under climate change scenarios due in part to increases in air temperature, which, in turn, could adversely affect coldwater fish species such as salmon (Brekke et al. 2009). It is critical that watershed management, planning, and regulatory approaches incorporate climate change science and understanding to ensure holistic and accurate analysis.

The total maximum daily load (TMDL) program is one of the primary frameworks for the nation to maintain and achieve healthy waterbodies, implemented pursuant to section 303(d) of the Clean Water Act (CWA). More than 40,000 TMDLs have been developed in the United States to determine the maximum pollutant loads allowable that would still permit attainment of water quality standards. However, the majority of these analyses have been conducted using assumptions of a stationary climate under which historical data on flow and temperature can be assumed to be an adequate guide to future conditions (Johnson et al. 2011). Research is needed to illuminate the ways in which climate change considerations could be incorporated into a TMDL, and how climate change might influence restoration plans.

The U.S. Environmental Protection Agency (EPA) Region 10 and EPA's Office of Research and Development (ORD) and Office of Water (OW) have launched a pilot research project to consider how projected climate change impacts could be incorporated into a TMDL and influence restoration plans. The pilot research project will use a temperature TMDL being developed for the South Fork Nooksack River (SFNR), in Washington, as the pilot TMDL for climate change analysis. An overarching goal of the pilot research project is to ensure that relevant findings and methodologies related to climate change are incorporated into the SFNR Temperature TMDL in such a way that the regulatory objectives and timelines of the TMDL are also met.

OBJECTIVES

This Statement of Work (SOW) is organized and maintains a “parallel task structure and numbering” that is consistent with the EPA Region 10 Climate Change and TMDL Pilot Project Research Plan (EPA/600/R/13/028, February 12, 2013) and this plan is available on EPA’s Internet Site (NSCEP) at www.epa.gov/nscep.

If there is an inconsistency between this SOW and the Project Research Plan, the SOW governs the Contractor’s scope and performance. This SOW supports Phase II of the Project Research Plan and is focused on the Research Analysis and Risk/Vulnerability Assessment.

The Quality Assurance Project Plan (QAPP) for the EPA Region 10 Climate Change and TMDL Pilot is being prepared by the Office of Research and Development (ORD) and will be completed by July 30, 2013.

The QAPP will briefly describe the overall project (referencing the Project Research Plan for details), and consist primarily of a description of quality assurance activities relating to Tasks 3 – Qualitative Assessment and Task 4 - Climate Change Considerations for TMDL Development in the SFNR. Task 3 is the comprehensive assessment of freshwater habitat for ESA salmon recovery in the SFNR under climate change. Task 4 will examine EPA TMDL requirements to identify potential areas where climate change could be considered for inclusion in the SFNR temperature TMDL.

Quality Assurance for Task 2 – Quantitative Assessment, is addressed in a separate QAPP completed by Washington’s Department Ecology, South Fork Nooksack River Temperature Total Maximum Daily Load (Quality Assurance Project Plan - Publication Number 12-03-126; October, 2012) and is available on Washington’s Department Ecology Internet Site at <https://fortress.wa.gov/ecy/publications/summarypages/1203126.html>.

WA 0-10 BASE PERIOD MILESTONE/DELIVERABLE ACCOMPLISHMENT:

2B: PowerPoint Presentation for 4th Annual PNW Climate Science Conference

Deliverable 5: Draft PowerPoint for PNW Conference

Deliverable 6: Final PowerPoint for PNW Conference

2C: Project Progress Report; ACE Task 204 – FY 2013 Project Deliverable

Deliverable 7: Draft Project Progress Report

Deliverable 8: Final Project Progress Report

4A: Final Reviewed Quantitative Assessment Report.

Deliverable 9: Final Report: Quantitative Assessment of Temperature Sensitivity of the South Fork Nooksack River under Future Climates using QUAL2Kw – Tetra Tech

5A: Climate Change Methodology for ESA Salmon Recovery Actions

Deliverable 10: Draft Final Report: Qualitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech

This Statement of Work (SOW) requests that the Contractor shall perform the following activities:

SPECIFIC TASKS:

Task 1: Project Contract Administration

Subtask 1A: Prepare Work Plan and Cost Estimate

Within 5 days of receipt of the Work Assignment (WA), the Contractor shall schedule a conference call with the Work Assignment Manager (WAM) to discuss and clarify the objectives and specific tasks of this work assignment.

The Contractor shall prepare a work plan in response to this work assignment, outlining the proposed approach, expertise and staffing, and resources needed, and a schedule to complete each task. The work plan should identify potential data and tools needed and any potential problems that might be encountered during the execution of the work assignment. It is recommended that the Contractor shall review the EPA Region 10 Climate Change and TMDL Pilot Project Research Plan (EPA/600/R/13/028, February 12, 2013) and this plan is available on EPA's Internet Site (NSCEP) at www.epa.gov/nscep.

Deliverable 1: Work Plan and Cost Proposal

Due: 15 days after receipt

Subtask 1B: Establish and Maintain Communication

Within seven days after work plan approval, the Contractor shall schedule a conference call, not to exceed 1 hour, with the EPA Work Assignment Manager (WAM) and appropriate Contractor staff to clarify outstanding questions and confirm the schedule and specific tasks. The Contractor shall provide verbal status updates to the WAM every other week. The Contractor shall initiate additional communication with the WAM should developments arise that may affect the conduct or schedule of this Work Assignment (WA).

The frequency of these meetings may be adjusted according to the needs of the project, and the Contractor shall initiate additional communication with the WAM should developments arise that will affect the conduct or schedule of this Work Assignment (WA). The Contractor shall prepare very brief minutes of meetings with EPA staff. The EPA will review the minutes to ensure that an accurate record of the communications has been made and filed.

Deliverable 2: Conference Call

Due: Within 7 days of work plan approval

Deliverable 3 (3.1-3.x): Meeting Minutes

Due: Within 2 days of meetings

Task 2: Project Documentation and Stakeholder Communication

Subtask 2A: Maintain MS SharePoint Project Documentation Library

The Contractor shall update and maintain the existing, Tetra Tech hosted, MS SharePoint Site for the EPA Region 10 Climate Change and TMDL Pilot. Project documentation includes; Project Research Plan, Research Plan Literature and associated EndNote Library, Workshop(s) Agenda, Presentations and Reports, GIS Data and Maps, Tables and Figures from all project reports and all other reports, data, communication and documentation for the Project Research Plan Tasks 1-5.

Deliverable 4: Interim SharePoint Status Memorandum Report

Due: December 31, 2013

Deliverable 5: Final SharePoint Status Memorandum Report

Due: September 15, 2014

Subtask 2B: PowerPoint Presentations for Stakeholder Communication

The Contractor shall create two PowerPoint Presentations on the “EPA Region 10 Climate Change and TMDL Pilot” project to support EPA Project Stakeholder Communication (briefings and/or seminars). These PowerPoint Presentations will build upon the existing library of project PowerPoint Presentations with updated information on the project’s status and findings/results from the Quantitative/Qualitative Analyses and Draft SFNR Temperature TMDL.

Deliverable 6: Draft PowerPoint Presentation #1

Due: 1 week after Technical Direction from the WAM

Deliverable 7: Final PowerPoint Presentation #1

Due: 1 week after Draft PowerPoint Presentation #1

Deliverable 8: Draft PowerPoint Presentation #2

Due: 1 week after Technical Direction from the WAM

Deliverable 9: Final PowerPoint Presentation #2

Due: 1 week after Draft PowerPoint Presentation #2

Task 3: Process Roadmap

The Contractor shall review, revise, and implement the process roadmap conceptual framework and procedures in the EPA Final Report (EPA Region 10 Climate Change and TMDL Pilot – Process Roadmap: Conceptual Framework and Procedures – Tetra Tech). All Level of Effort (LOE) for the Process Roadmap shall be included in the EPA Final Report (Task 7).

Task 4: Quantitative Assessment

Task Description:

Subtask 4A: Final Peer Reviewed Quantitative Assessment Report for EPA/ORD clearance and publication.

The Contractor shall review, revise and reconcile the “EPA Region 10 Climate Change and TMDL Pilot – Quantitative Assessment of Temperature Sensitivity of the South Fork Nooksack River under Future Climates using QUAL2Kw; Draft Report – Tetra Tech” based on comments received from the EPA Peer Review. This review is a Formal Peer Review and the Contractor is expected to reconcile all comments. The Contractor and EPA (WAM) will jointly review all submitted comments and via conference call agree on the scope and responsiveness to the comments as a guide to production of the Peer Reviewed Final Report. The Contractor shall prepare a reconciliation memorandum for each of the three Peer Reviewers.

Deliverable 10: Final Report: Quantitative Assessment of Temperature Sensitivity of the South Fork Nooksack River under Future Climates using QUAL2Kw – Tetra Tech with reconciliation memorandums.
Due: November 15, 2013 or 2 weeks after receipt of review comments.

Subtask 4B: PowerPoint Presentation(s) for Technical Transfer Communication

The Contractor shall create and deliver, via Webinar, one PowerPoint Presentation Seminar on the “EPA Region 10 Climate Change and TMDL Pilot – Quantitative Assessment of Temperature Sensitivity of the South Fork Nooksack River under Future Climates using QUAL2Kw; Final Report – Tetra Tech” to an audience of EPA Regional, Office of Water, State DEQs, Tribal Environmental Organizations and TMDL Practitioners. Note: It is possible that demand for the Webinar may exceed the Webinar or conference line capacity. In that case, a second Webinar will be presented.

Deliverable 11: Final Technical Transfer PowerPoint Presentation
Due: December 1, 2013 or 2 weeks after EPA/ORD clearance and publication of the Quantitative Assessment
Deliverable 12: Webinar of Technical Transfer PowerPoint Presentation
Due: December 8, 2013 or 1 week after Final Technical Transfer PowerPoint Presentation.

Task 5: Qualitative Assessment

Task Description:

Subtask 5A: Climate Change Methodology for ESA Salmon Recovery Actions.

The draft methodology for the Qualitative Assessment has been developed by the “Core Interdisciplinary Team (CIDT)” (EPA ORD, Nooksack Indian Tribe – Natural Resources Staff and NOAA Fisheries) with support from the Contractor.

A Workshop was held on January 22-23, 2013 in Bellingham, WA to solicit input on the Qualitative Assessment with the WRIA 1 Salmon Recovery Team and other interested Stakeholders in the South Fork Nooksack River. A commitment was made by EPA to include those Stakeholders in a “Virtual Interdisciplinary Team (VIDT)” to participate in the Qualitative Assessment. EPA will utilize Webinar and Email technology to implement that participation.

The Contractor shall support EPA in planning, conducting, facilitating and documenting a Webinar (#1) with the VIDT to initiate their involvement and participation in the Qualitative Assessment. The Draft Final Report: Quantitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech and other material developed by the CIDT and Tetra Tech will be presented to the VIDT on October 3, 2013.

The Contractor shall prepare an EPA/ORD (Format to be supplied by WAM) Quality Assurance Project Plan (QAPP) for the Qualitative Assessment. It is anticipated that the majority of the technical requirement and content for the QAPP will originate in the Final Report: Quantitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech (Deliverable 14).

Deliverable 13: VIDT Webinar Report (#1): Draft Qualitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech

Due: 1 week after the VIDT Webinar (#1)

Deliverable 14: Final Report: Qualitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech

Due: 1 week after completing VIDT Webinar Report (#1)

Deliverable 15: QAPP Qualitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech

Due: 1 week after completing Final Report: Qualitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech

Subtask 5B: Conducting the Qualitative Assessment of Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions

The Contractor shall support the conduct of the Qualitative Assessment by the CIDT. The Nooksack Indian Tribe is leading the CIDT in conducting the Qualitative Assessment as they were the lead Tribal Government in writing the current WRIA 1 ESA Salmon Plan Recovery Plan. The Qualitative Assessment Report is expected to be 10-15 pages in length, including Figures, Tables and Literature Cited.

The Contractor shall support the conduct of the Qualitative Assessment by writing some sections, editing all sections, developing/editing Figures and Tables and compiling Literature Cited into an EndNote Library for the Draft Report.

The Contractor shall support the conduct of the Qualitative Assessment by the CIDT with two Conference Calls. The Contractor shall plan and document (with meeting notes) two Conference Calls with the CIDT.

Deliverable 16: Draft Final Report: Qualitative Assessment - Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe

Due: November 30, 2013, 1 week after the second Conference Call and review/comment of the Draft Report by the CIDT.

The Contractor shall support EPA in planning, conducting, facilitating and documenting a Webinar (#2) with the VIDT to continue their involvement and participation in the Qualitative Assessment. The Draft Final Report: Qualitative Assessment - Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe and other material developed by the CIDT and Tetra Tech will be presented to the VIDT on December 7, 2013.

Deliverable 17: VIDT Webinar Report (#2): Draft Final Report: Qualitative Assessment - Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe.

Due: 1 week after the VIDT Webinar (#2)

Deliverable 18: Final Report: Qualitative Assessment – Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe.

Due: 1 week after completing VIDT Webinar Report (#2)

Subtask 5C: WRIA 1 Integrated Governance Structure – Stakeholder Engagement for the Qualitative Assessment of Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions

The Contractor shall support EPA in planning, conducting, facilitating and documenting a Webinar (#3) with the WRIA 1 Watershed and Salmon Recovery Teams. The purpose of this Webinar (#3) is to provide an informational briefing on the Final Report: Qualitative Assessment – Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe on January 6, 2014.

The Contractor shall prepare a PowerPoint Presentation for this meeting based on the Final Report: Qualitative Assessment – Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe.

Deliverable 19: *PowerPoint Presentation based on:* Final Report: Qualitative Assessment - Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe.

Due: 1 week before the VIDT Webinar (#3)

Deliverable 20: VIDT Webinar Report (#3): Final Report: Qualitative Assessment - Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe.

Due: 1 week after the VIDT Webinar (#3)

The Contractor shall support EPA in planning, conducting, facilitating and documenting a “physical meeting” in Bellingham, WA with the WRIA 1 Management Team. The purpose of this meeting is to provide an informational briefing and submit the Final Report: Qualitative Assessment – Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe as recommendations for consideration by the WRIA 1 Joint Policy Board on January 15, 2014 or as scheduled by the WRIA 1 Management Team.

The PowerPoint Presentation from VIDT Webinar (#3), as modified, will be used for this meeting.

Deliverable 21: *Meeting Report – WRIA 1 Management Team:* Final Report: Qualitative Assessment - Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe.

Due: 1 week after the Bellingham, WA Meeting

Task 6: Climate Change Considerations for TMDL Development in the SFNR

Task Description:

The objectives and methods of Task 4 have changed from the approach outlined in the Project Research Plan. This task was originally developed as a structured assessment based on the TMDL and Climate Change Process Steps (Figures 1 and 2) of the Project Research Plan.

Subtask 6A: Climate Change Considerations for TMDL Development in the SFNR

The first objective now is to provide input to the SFNR Temperature TMDL from the Quantitative and Qualitative Assessment Reports. The second objective is to develop retrospective documentation of TMDL and Climate Change Process Steps (Figures 1 and 2) of the Project Research Plan in the EPA Final Report.

The Contractor shall support the first objective by providing input to the SFNR Temperature TMDL from the Quantitative and Qualitative Assessment Reports. It is expected that most of this input will come directly from the developed Quantitative and Qualitative Assessment Reports.

Deliverable 22: Draft Report: Climate Change Considerations for TMDL Development in the SFNR – Tetra Tech

Due: 2 weeks after request (through the WAM) by the SFNR Temperature TMDL EPA Region 10 Staff Lead.

Task 7: EPA Final Report

Task Description:

Subtask 7A Title: Develop the Draft Outline for the EPA Final Report

The Contractor shall develop the Draft Outline for the EPA Final Report.

The Contractor is expected to utilize the Figures, Tables and Master Reference Endnote Library from the task reports and documented under Subtask 2A: Maintain MS SharePoint Documentation.

Deliverable 23: Draft Outline: EPA Final Report – Tetra Tech

Due: November 30, 2013.

Subtask 7B Title: Write the Draft EPA Final Report

The Contractor shall write, review and revise the Draft EPA Final Report. The Contractor is expected to utilize the Figures, Tables and Master Reference Endnote Library from the task reports and documented under Subtask 2A: Maintain MS SharePoint Documentation.

Deliverable 24: Draft Report: EPA Final Report – Tetra Tech

Due: April 30, 2014.

Subtask 7C Title: Peer Review and Reconciliation of the Draft EPA Final Report

The Contractor shall review, revise and reconcile the Draft EPA Final Report based on comments received from the EPA Peer Review. This review is a Formal Peer Review and the Contractor is expected to reconcile all comments. The Contractor and EPA (WAM) will jointly review all submitted comments and via conference call agree on the scope and responsiveness to the comments as a guide to production of the Peer Reviewed Final Report. The Contractor shall prepare a reconciliation memorandum for each of the three Peer Reviewers.

Deliverable 25: EPA Final Report with reconciliation memorandums.

Due: June 30, 2014 or 2 weeks after receipt of review comments.

Subtask 7D Title: EPA Final Report Review and Clearance

The Contractor shall support EPA/ORD to review, revise and reconcile the EPA Final Report based on comments received from the EPA/ORD Clearance Process. The Contractor is expected to reconcile all comments. The Contractor and EPA (WAM) will jointly review all submitted comments and via conference call agree on the scope and responsiveness to the comments as a guide to production of the EPA Final Report. The Contractor shall prepare a reconciliation memorandum for the comments received during the EPA/ORD Clearance Process.

Deliverable 26: EPA Final Report with reconciliation memorandum.

Due: August 30, 2014 or 2 weeks after receipt of EPA/ORD Clearance Process review comments.

MILESTONES AND DELIVERABLES:

Task	Milestone/Deliverable	Due Date
1	Project Contract Administration 1A: Work Plan and Cost Estimate Deliverable 1: Work Plan and Cost Proposal 2B: Establish and Maintain Communication Deliverable 2: Conference Call Deliverable 3 (3.1-3.x): Meeting Minutes	Within 15 days of receipt of WA Within 7 days after WP approval Within 2 days after Meetings
2	Project Documentation and Stakeholder Communication 2A: Maintain MS SharePoint Project Doc Library Deliverable 4: Interim SharePoint Status Memorandum Report Deliverable 5: Final SharePoint Status Memorandum Report 2B: PowerPoint Presentations for Stakeholder Communication Deliverable 6: Draft PowerPoint Presentation #1 Deliverable 7: Final PowerPoint presentation #1 Deliverable 8: Draft PowerPoint Presentation #2 Deliverable 9: Final PowerPoint presentation #2	December 31, 2013 September 15, 2014 1 week after Technical Direction from the WAM (#1) 1 week after Draft PowerPoint Presentation #1 1 week after Technical Direction from the WAM (#2) 1 week after Draft PowerPoint Presentation #2
3	Process Roadmap	
4	Quantitative Assessment 4A: Final Peer Reviewed Quantitative Assessment Report for EPA/ORD clearance and publication Deliverable 10: Final Report: Quantitative Assessment of Temperature Sensitivity of the South Fork Nooksack River under Future Climates using QUAL2Kw – Tetra Tech with reconciliation memorandums	November 15, 2013 or 2 weeks after receipt of review comments

Task	Milestone/Deliverable	Due Date
	4B: PowerPoint Presentation(s) for Technical Transfer Communication Deliverable 11: Final Technical Transfer PowerPoint Presentation Deliverable 12: Webinar of Technical Transfer PowerPoint Presentation	December 1, 2013 or 2 weeks after EPA/ORD clearance and publication of the Quantitative Assessment December 8, 2013 or 1 week after Final Technical Transfer PowerPoint Presentation
5	Qualitative Assessment 5A: Climate Change Methodology for ESA Salmon Recovery Actions Deliverable 13: VIDT Webinar Report (#1): Draft Qualitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech Deliverable 14: Final Report: Qualitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech Deliverable 15: QAPP Qualitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech 5B: Conducting the Qualitative Assessment Deliverable 17: VIDT Webinar Report (#2): Draft Final Report: Qualitative Assessment - Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe. Deliverable 18: Final Report: Qualitative Assessment – Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe	1 week after the VIDT Webinar (#1) 1 week after completing the VIDT Webinar Report (#1) 1 week after completing Final Report: Qualitative Assessment - Methodology for Evaluating Climate Change on Endangered Species Act Recovery Actions – Tetra Tech 1 week after the VIDT Webinar (#2) 1 week after completing VIDT Webinar Report (#2)

Task	Milestone/Deliverable	Due Date
	<p>Subtask 5C: WRIA 1 Integrated Governance Structure – Stakeholder Engagement for the Qualitative Assessment of Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions</p> <p>Deliverable 19: PowerPoint Presentation based on: Final Report: Qualitative Assessment - Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe.</p> <p>Deliverable 20: VIDT Webinar Report (#3): Final Report: Qualitative Assessment - Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe</p> <p>Deliverable 21: Meeting Report – WRIA 1 Management Team: Final Report: Qualitative Assessment - Risk/Vulnerability of Climate Change on ESA Salmon Recovery Actions In the South Fork Nooksack River, WA – Nooksack Indian Tribe.</p>	<p>1 week before the VIDT Webinar (#3)</p> <p>1 week after the VIDT Webinar (#3)</p> <p>1 week after the Bellingham, WA Meeting</p>
6	<p>Climate Change Considerations for TMDL Development in the SFNR</p> <p>6A: Climate Change Considerations for TMDL Development in the SFNR</p> <p>Deliverable 22: Draft Report: Climate Change Considerations for TMDL Development in the SFNR – Tetra Tech</p>	<p>2 weeks after request (through the WAM) by the SFNR Temperature TMDL EPA Region 10 Staff Lead.</p>
7	<p>EPA Final Report</p> <p>7A: Develop the Draft Outline for the EPA Final Report</p> <p>Deliverable 23: Draft Outline: EPA Final Report – Tetra Tech</p> <p>7B: Write the Draft EPA Final Report</p> <p>Deliverable 24: Draft Report: EPA Final Report – Tetra Tech</p>	<p>November 30, 2013</p> <p>April 30, 2014</p>

Task	Milestone/Deliverable	Due Date
	7C: Peer Review and Reconciliation of the Final Report	
	Deliverable 25: EPA Final Report with reconciliation memorandums.	June 30, 2014 or 2 weeks after receipt of review comments.
	7D: EPA Final Report Review and Clearance	
	Deliverable 26: EPA Final Report with reconciliation memorandum.	August 30, 2014 or 2 weeks after receipt of EPA/ORD Clearance Process review comments

ACCEPTANCE CRITERIA:

The Contractor shall complete high quality work as demonstrated in the Base Period of this Contract and under the previous EPA National Water Contract. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

CONFLICT OF INTEREST:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

MANAGEMENT CONTROLS:

1. The EPA will review and provide comments on the Work Plan and QAPP.
2. The EPA will also review and provide comments on the subsequent module outlines, module drafts, and conceptual models for each of the candidate causes.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.
4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

The WAM/COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS WORK ASSIGNMENT:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

Work Assignment Form. (WebForms v1.0)

EPAUnited States Environmental Protection Agency
Washington, DC 20460**Work Assignment**

Work Assignment Number

1-11

☐ Other☐ Amendment Number:

Contract Number

EP-C-12-060

Contract Period 09/30/2012 To 09/29/2014

Base

Option Period Number 1

Title of Work Assignment/SF Site Name

Refining State Water Quality

Contractor

TETRA TECH, INC.

Specify Section and paragraph of Contract SOW

2h

Purpose:



Work Assignment



Work Assignment Close-Out



Work Assignment Amendment



Incremental Funding



Work Plan Approval

Period of Performance

From 09/30/2013 To 09/29/2014

Comments:



Superfund

Accounting and Appropriations Data



Non-Superfund

SFO
(Max 2)

Note: To report additional accounting and appropriations data use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:

Cost/Fee:

LOE:

09/30/2012 To 09/29/2014

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated:

Cost/Fee:

LOE:

Cumulative Approved:

Cost/Fee:

LOE:

Work Assignment Manager Name Brian Thompson

Branch/Mail Code:

Phone Number 312-353-6066

FAX Number:

(Signature)

(Date)

Project Officer Name Sharon Boyde

Branch/Mail Code:

Phone Number: 703-347-8576

FAX Number: 703-374-8696

(Signature)

(Date)

Other Agency Official Name

Branch/Mail Code:

Phone Number:

FAX Number:

(Signature)

(Date)

Contracting Official Name Mark Cranley

Branch/Mail Code: CPDP

Phone Number: 513-487-2351

FAX Number: 513-487-2109

(Signature)

09/26/13
(Date)

PERFORMANCE WORK STATEMENT
Tetra Tech, Inc. Contract EP-C-012-060
Work Assignment 1-11

Title: Refining State Water Quality Monitoring Programs and Aquatic Life Uses

Work Assignment Manager:

Brian Thompson
USEPA Region 5
77 W Jackson Blvd (WQ -16J)
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thompson.brian@epa.gov

Alternate EPA WAM:

Marietta Newell
USEPA Region 5
77 W Jackson Blvd (WQ -16J)
Chicago, IL 60604
312-353-4513
newell.marietta@epa.gov

SOW Section: 2.8

Period of Performance: September 30, 2013 to November 30, 2014

Background

EPA Region 5 is working with States in Region 5 in reviewing and revising their water quality monitoring programs to make them more efficient in providing information for water quality management decisions, including decisions on water quality assessments, reporting under 303(d) and 305(b) and developing total maximum daily loads, developing or refining water quality criteria, supporting public health advisories, supporting watershed planning efforts, determining performance of watershed restoration efforts, and refining aquatic life designated uses. With guidance and support from the U.S. Environmental Protection Agency (U.S. EPA), Yoder and Barbour (2009) present a process to evaluate the technical rigor of how states or tribes use biological information to support their water-protection and regulation programs in meeting the objectives and responsibilities of the Federal Clean Water Act (CWA). A primary goal of this program-evaluation process is for states and tribes to adopt and be able to support the application of refined designated aquatic-life uses and associated numeric biological criteria in their water-quality standards. The highest defined level of technical rigor is called "Level 4." A water-quality-management program that achieves Level 4 has sufficient technical rigor to incorporate and rely on biological information in meeting CWA responsibilities. State programs with robust biological assessment information are effective in supporting water quality program needs, including defining aquatic life uses and approaches for deriving biological criteria, monitoring biological condition, supporting causal analysis, and developing stressor-response relationships.

This work assignment is to review Indiana Department of Environmental Management's (IDEM) biological assessment program (i.e., how IDEM collects, interprets, and uses biological information to support water-quality regulation and management in Indiana streams) and, based on that review, inform IDEM on improvements that are needed to achieve a Level 4 bioassessment program. This work assignment builds on previous efforts by Indiana to evaluate its biological assessment programs and refine its designated uses. As an initial step of IDEM's program evaluation, Chris Yoder (Midwest Biodiversity Institute, MBI) and the former Biological Studies Section within IDEM's Office of Water Quality rated some of the *critical elements* of IDEM's biological assessment program (last review completed in 2007). A *critical element* is a specific aspect of how a state or tribe collects, interprets, or uses biological information to support water-quality regulation

and management, as defined in EPA's "*Biological Assessment Program Review: Assessing Level of Technical Rigor to Support Water Quality Management*" (U.S. EPA 2013, EPA 820-R-13-001). This work assignment includes an assessment of the 13 *critical elements* of IDEM's biological assessment program, including technical development for each element, as well as a characterization of the overall level of rigor of IDEM's bioassessment program. The review of IDEM's bioassessment program will provide information on:

- the strengths of the IDEM bioassessment program
- the limitations of the IDEM bioassessment program
- resource allocation and prioritization for improving IDEM's biological assessment program
- integration of biological assessments to more precisely describe aquatic life uses and develop numeric biological criteria

Quality Assurance:

This work assignment does not involve activities that need a quality assurance or quality control plan. Under this work assignment, data will not be generated or used in any environmental decision making. The Contractor is limited to technical support on the refinement of designated uses.

Scope of Work:

The objective of this project is to improve IDEM's biological assessment program in support of the application of refined designated aquatic-life uses and associated numeric biological criteria in their water-quality standards to run a Level 4 biological assessment and information program. The specific sub-objectives of this work assignment are:

1. Update and finalize the current ratings of each *critical element* of IDEM's biological assessment program (i.e., how IDEM collects, interprets, and uses biological information to support water-quality regulation and management in Indiana streams where fish and macroinvertebrate indices currently apply).
2. For each *critical element* that is not yet achieving the highest level of technical rigor (i.e., Level 4), specify how to improve the technical rigor to Level 4 status. Specific needs for aspects of each critical element need to be defined.
3. Completion of draft and final reports compiling the work completed in the two preceding objectives.

TASKS

Task 0 – Work plan and Monthly Progress Reports

The contractor shall prepare a detailed work plan and budget for the indicated tasks in this performance work statement. The work plan shall include a description of: (a) proposed staff; (b) the number of hours and labor classifications proposed for each task, to include both prime contractor and subcontractor labor; and (c) a list of deliverables, with due dates and schedule for deliverables. If a subcontractor(s) is proposed and subcontractors are outside the metropolitan DC area, the contractor shall include information on plans to manage work and contract costs. All professional (P) levels, hours and total dollars for each task shall be provided, and other direct costs greater than \$100.00 shall be itemized in detail. The contractor shall provide their job number with all invoices to facilitate their expediency.

This task includes telephone calls, as needed, between the EPA WAM and the Contractor. The

EPA WAM expects no more than 1 telephone call per month with each call lasting one hour. Only one person from the Contractor is expected to participate in the call. This task also includes monthly progress and financial reports. Monthly financial reports shall include a table with the invoice Level of Effort (LOE) and costs broken out by the tasks in this performance work statement.

Task 1: Identify Technical Expert and Provide Project Scoping Report

The Contractor shall identify and provide a technical expert to meet the sub-objectives described under the “Scope of Work,” above. The technical expert must be fully versed and have extensive experience in 1) the evaluation of *critical elements* necessary for a Level 4 biological assessment and information program (*i.e.*, in support of CWA regulations) and 2) the evaluation of State and Tribal Tiered Aquatic Life Use program needs. Prior to initiating Tasks 2-4, below, the technical expert will provide a project scoping report to U.S. EPA.

Task 2: Hold a 3-day on-site review of IDEM’s biological assessment program

The Contractor’s technical expert shall hold a 3-day on-site review of IDEM’s biological assessment program in Indianapolis, with IDEM monitoring, bioassessment, and WQS managers and staff. As an outcome of the on-site review, the Contractor’s technical expert shall:

- Complete a draft *critical elements* matrix with IDEM staff.
- Collect and discuss programmatic data and information with IDEM staff and managers.
- Collect all programmatic documentation and references in support of developing the technical memorandum described in Tasks 3 and 4.

Task 3: Draft Report on Recommendations for Improving Indiana’s Bioassessment Program

The Contractor’s technical expert shall develop a *draft* report that:

- a) Updates and finalizes the current ratings of each *critical element*. Currently, a preliminary rating for each of the 13 *critical elements* exists of IDEM’s biological assessment program.
- b) Critically reviews IDEM’s biological assessment program, and for each *critical element* that is not yet achieving the highest level of technical rigor (*i.e.*, Level 4), develops specific recommendations that are needed to improve the technical rigor of Indiana bioassessment program to Level 4 status. The technical expert will develop recommendations for as many of the 13 *critical elements* for which revisions are necessary. The Contractor should expect that revisions are necessary to all 13 *critical elements*.

The *draft* report shall include:

- A description of the level of rigor of the 13 *critical elements* and technical gaps within those elements.
- Specific recommendations on improving the biological indicators used by IDEM.
- A technical memorandum describing IDEM’s current monitoring and assessment, bioassessment, and water quality standards programs, and how they are used together to support water quality management in Indiana.
- Recommendations on targeting resources more efficiently to better support water quality management decisions.

The contractor’s technical expert shall incorporate into the draft report input from the EPA WAM.

Task 4: *Final Report on Recommendations for Improving Indiana's Bioassessment Program*

The Contractor's technical expert shall develop a *final* report that:

- a) Updates and finalizes the current ratings of each *critical element*. Currently, a preliminary rating for each of the 13 *critical elements* exists of IDEM's biological assessment program.
- b) Critically reviews IDEM's biological assessment program, and for each *critical element* that is not yet achieving the highest level of technical rigor (i.e., Level 4), develops specific recommendations that are needed to improve the technical rigor of Indiana bioassessment program to Level 4 status. The technical expert will develop recommendations for as many of the 13 *critical elements* for which revisions are necessary. The Contractor should expect that revisions are necessary to all 13 *critical elements*.

The *final* report shall include (i.e., same elements as in the *draft* report):

- A description of the level of rigor of the 13 *critical elements* and technical gaps within those elements.
- Specific recommendations on improving the biological indicators used by IDEM.
- A technical memorandum describing IDEM's current monitoring and assessment, bioassessment, and water quality standards programs, and how they are used together to support water quality management in Indiana.
- Recommendations on targeting resources more efficiently to better support water quality management decisions.

The contractor's technical expert shall incorporate into the *final* report input from the EPA WAM.

METHODS

In conducting Tasks 2, 3, and 4, the Contractor shall follow "*Biological Assessment Program Review: Assessing Level of Technical Rigor to Support Water Quality Management*" (U.S. EPA 2013, EPA 820-R-13-001).

SCHEDULE OF DELIVERABLES:

TASK	DELIVERABLE	DATE DUE TO EPA
0	Work Plan and MPRs	Within 15 calendar days after receipt of WA
1	Identify Technical Expert and Provide Project Scoping Report	Within 15 calendar days of Work Plan approval (approx. Oct. 15, 2013)
2	3-day on-site review of IDEM's biological assessment program	January 2014
3	Completion of <i>Draft</i> Report	June 2014
4	Completion of <i>Final</i> Report	July 2015

Travel

Travel by the Contractor is needed under this performance work statement for one trip to IDEM's office in Indianapolis, IN.

Software Application Files and Accessibility

Software Application files, if delivered to the Government, shall conform to the requirements relating to accessibility as detailed to the 1998 amendments to the Rehabilitation Act, particularly, but not limited to, § 1194.21 Software applications and operating systems and § 1194.22 Web-based intranet and internet information and applications. See: <http://www.section508.gov/>

Preferred text format: Office 2007 or higher

Preferred graphics format: Each graphic is an individual GIF file

Preferred portable format: Adobe Acrobat, version 6.0

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 1-11								
		<input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060	Contract Period 09/30/2012 To 09/29/2014 Base Option Period Number 1	Title of Work Assignment/SF Site Name Refining State Water Quality M								
Contractor TETRA TECH, INC.		Specify Section and paragraph of Contract SOW								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input checked="" type="checkbox"/> Work Plan Approval		Period of Performance From 09/30/2013 To 09/29/2014								
Comments:										
<input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
SFO (Max 2) <input type="checkbox"/> Note: To report additional accounting and appropriations date use EPA Form 1900-69A.										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period: 09/30/2012 To 09/29/2014		Cost/Fee: \$0.00		LOE: 0						
This Action:		\$16,948.00		162						
Total:		\$16,948.00		162						
Work Plan / Cost Estimate Approvals										
Contractor WP Dated: 11/07/2013		Cost/Fee: \$16,948.00		LOE: 162						
Cumulative Approved:		Cost/Fee: \$16,948.00		LOE: 162						
Work Assignment Manager Name Brian Thompson						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number 312-353-6066				
						FAX Number:				
Project Officer Name Sharon Boyde						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number: 703-347-8576				
						FAX Number: 703-374-8696				
Other Agency Official Name						Branch/Mail Code:				
_____ (Signature)						_____ (Date)				
						Phone Number:				
						FAX Number:				
Contracting Official Name Mark Cranley						Branch/Mail Code: CPOD				
_____ (Signature)						_____ (Date)				
						Phone Number: 513-487-2351				
						FAX Number: 513-487-2109				

EPA United States Environmental Protection Agency Washington, DC 20460		Work Assignment Number 1-12								
Work Assignment		<input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2014 Base Option Period Number 1								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Methods Computing Downstream								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Specify Section and paragraph of Contract SOW 2a								
		Period of Performance From 09/30/2013 To 09/29/2014								
Comments:										
<div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> Superfund <div style="text-align: center;">Accounting and Appropriations Data</div> <input checked="" type="checkbox"/> Non-Superfund </div>										
SFO <input type="checkbox"/> Note: To report additional accounting and appropriations data use EPA Form 1900-69A. (Max 2)										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
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4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:				LOE:				
09/30/2012 To 09/29/2014										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:		Cost/Fee:				LOE:				
Cumulative Approved:		Cost/Fee:				LOE:				
Work Assignment Manager Name Jim Hagy						Branch/Mail Code:				
_____ (Signature)						Phone Number 850-934-2455				
_____ (Date)						FAX Number:				
Project Officer Name Sharon Boyde						Branch/Mail Code:				
_____ (Signature)						Phone Number: 703-347-8576				
_____ (Date)						FAX Number: 703-374-8696				
Other Agency Official Name						Branch/Mail Code:				
_____ (Signature)						Phone Number:				
_____ (Date)						FAX Number:				
Contracting Official Name Mark Cranley						Branch/Mail Code: CPOD				
_____ (Signature)						Phone Number: 513-487-2351				
_____ (Date)						FAX Number: 513-487-2109				

PERFORMANCE WORK STATEMENT

Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 1-12

TITLE: Methods for Computing Downstream Use Protection Criteria for Lakes and Reservoirs

PERIOD OF PERFORMANCE: October 18, 2013 through September 29, 2014

WORK ASSIGNMENT MANAGER: James D. Hagy III
U.S. Environmental Protection Agency
Office of Research and Development
National Health and Environmental
Effects Research Laboratory
Gulf Ecology Division
1 Sabine Island Drive
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850-934-2455 (voice)
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INTRODUCTION

Excess loading of N and P is among the most prevalent cause of water quality impairment in the United States, affecting 6,950 surface water bodies for nutrients and 6,511 surface water bodies for organic enrichment/ oxygen depletion (2010 CWA Sec. 303(d) List). Excess N and P in aquatic systems comes from many point and nonpoint sources, including urban and suburban stormwater runoff, municipal and industrial waste water discharges, fertilizer use, livestock production, atmospheric deposition resulting from fossil fuel combustion and ammonia emissions from industrial scale agriculture, and legacy groundwater nutrient pollution. Land use alterations in watersheds across the nation increase the fraction of the N and P applied to the landscape that reaches surface and groundwater resources, impacting aquatic life uses, human health and economic prosperity.

One immediate need that will support the long-term goal of optimal and sustainable nutrient management stems from an emerging view that existing narrative nutrient criteria are inadequate to protect the Nation's waters from possible impacts resulting from nutrient enrichment. Scientifically sound methodologies are needed for translating narrative nutrient criteria to develop quantitative and enforceable numeric nutrient criteria. Nowhere is this need more apparent than for the Nation's freshwaters, which are bound closely within watersheds directly to the anthropogenic factors that lead to nutrient impairments. Unfortunately, there are thousands of lakes and reservoirs and even more stream reaches draining into these receiving waters, making the task of developing numeric criteria waterbody-by-waterbody truly enormous. In the past, EPA has addressed the large number of waterbodies using a classification and reference condition approach, developing criteria by ecoregion and waterbody type. Another possible

approach to managing nutrient enrichment in freshwater systems rests on re-casting the problem as one involving not thousands of separate water bodies (lakes and reservoirs, stream reaches, etc.), but a relatively smaller (but still large) number of watersheds. Within watersheds, receiving waters are focal points for nutrient effects resulting from nutrients transported in stream and river networks. Nutrient concentrations in lakes - and resulting water quality - reflect nutrient concentrations in the contributing rivers and streams, as modified by lake processes. Consequently, nutrient management in lakes could be improved by improving our ability to describe nutrient sensitive aquatic life uses in lakes and possible relationships to nutrient inputs and resulting water quality. Subsequently, management of nutrients in streams and rivers that discharge into lakes may be linked to the requirements for protecting downstream lakes. A similar approach could be used to inform management of nutrients in streams and rivers that flow into downstream estuaries and coastal waters, but is not the focus of this project.

EPA is currently funding (contract completion, December 2013) research to identify nutrient-sensitive aquatic life use endpoints that could be used to develop numeric nutrient criteria for natural lakes in the upper midwestern US and reservoirs in the southeastern US. This work assignment is to build on that research to (1) develop relationships between nutrient loading and/or concentration and identified aquatic life use endpoints for lakes and reservoirs and (2) develop a model or models and associated justification for computing numeric criteria for streams within the watershed of targeted lakes or reservoirs that, if met, would provide an expectation that the identified nutrient-sensitive aquatic life uses of the receiving lake or reservoir would not be impaired by nutrients from the watershed draining into the lake.

OBJECTIVES

The objectives of this project will be to describe new approaches that could be used to develop numeric nutrient criteria for lakes and their contributing networks of streams and rivers. The research effort will utilize existing publications and data rather than new field studies. Project focus areas will include (1) characterizing aquatic life uses of US lakes and identifying which among these uses are most sensitive to impacts resulting from nutrient enrichment, (2) evaluating existing science and developing new analyses to predict nutrient concentrations in lakes and their watersheds and the relationship between nutrients and support for aquatic life uses, and (3) developing methods for computing numeric nutrient criteria for streams in order to protect downstream lakes and reservoirs.

The work assignment is structured into 5 research tasks and three process related tasks. In **Task 1**, the Contractor will develop a workplan and QAPP. As this work involves difficult conceptual and technical challenges, this task is afforded 30 days, with an additional 2 weeks to complete the final QAPP. **Tasks 2 through 5** describe two aspects of the project (nutrient criteria development and DPV development) to be implemented for each of two focal areas. All four of these tasks are related but not dependent. Therefore, they can be pursued concurrently. Each has a mid-year and draft final report deliverable. These may be combined to provide a single mid-year progress report and a draft final report, but each task must be specifically addressed in each. **Task 6** is development of a final project report and presentation to EPA ORD and OW via a webinar. **Task 7** encompasses communication and record keeping throughout the duration of the project.

SPECIFIC TASKS:

Task 1. Develop a Detailed Work Plan and QAPP.

After consultation with the WAM, the contractor shall develop a detailed work plan addressing the objectives of this work assignment and the basic outline provided by the Tasks (below) and associated deliverables (below) and submit it to EPA for review. Will EPA review the work plan within 2 weeks of receiving it and return it to the contractor for any necessary revision.

The contractor shall also develop a single Quality Assurance Project Plan (QAPP) addressing all work outlined in the work plan and submit it to EPA for review and approval by the WAM and the EPA QA Officer. Work on the QAPP may proceed concurrently with development of the work plan. The QAPP shall outline the approach and measures the Contractor will implement to ensure a high standard of quality in data analysis and written deliverables. The QAPP shall be in conformance with EPA's Requirements for Quality Assurance Project Plans (EPA QA/R-5). EPA will review and approve the QAPP within two (2) weeks after receiving it.

Task 1 Deliverable (1a): Submit a detailed work plan to EPA for approval. Due 30 days after Work Assignment award date.

Task 1 Deliverable (1b): Submit a QAPP to EPA for approval. Due 14 days after final approval of work plan.

Task 2. Develop quantitative methods for determining nutrient loading or concentration limits that will protect identified nutrient-sensitive aquatic life uses in a small subset of upper midwest lakes.

In this task, the contractor shall devise and implement an analytical procedure using existing data to determine numeric nutrient concentrations or loading limits that, if achieved, would be expected to support attainment of one or more identified nutrient-sensitive aquatic life uses in upper midwest lakes. Work under this task will build on ongoing work being completed by TetraTech that is identifying an appropriate sample of lakes, building data sets, and analyzing feasible approaches for defining aquatic life uses. This task is intended to demonstrate possible approaches, rather than to actually develop criteria for any particular lake. Therefore, the study site(s) shall be selected optimally based on data availability and other factors to further this research purpose. Work under this task shall include describing the rationale for the analytical approach and any significant technical challenges, in addition to a description of the final approach that is developed.

Task 2 Deliverable (2a). Six-month progress report on approaches for developing numeric nutrient criteria that support identified nutrient-sensitive aquatic life uses for one or more upper midwest lakes. *Due 6 months after QAPP approval.*

Task 2 Deliverable (2b). Draft final report on approaches for developing numeric nutrient criteria that support identified nutrient-sensitive aquatic life uses for one or more upper midwest

lakes. *Due 11 months after QAPP approval.*

Task 3. Develop quantitative methods for determining nutrient loading or concentration limits that will protect identified nutrient-sensitive aquatic life uses in a small subset of southeast reservoirs.

In this task, the contractor shall devise and implement an analytical procedure using existing data to determine numeric nutrient concentrations or loading limits that, if achieved, would be expected to support attainment of one or more identified nutrient-sensitive human and aquatic life uses in southeastern reservoirs. Work under this task will build on ongoing work being completed by TetraTech that is identifying an appropriate sample of lakes, building data sets, and analyzing feasible approaches for defining human and aquatic life uses. This task is intended to demonstrate possible approaches, rather than to actually develop criteria for any particular lake. Therefore, the study site(s) shall be selected optimally based on data availability and other factors to further this research purpose. Work on this task shall include discussion of any issues related to developing criteria when management for different human and aquatic life uses result in conflicting ecological requirements.

Task 3 Deliverable (3a). Six-month progress report on approaches for developing numeric nutrient criteria that support identified nutrient-sensitive human and aquatic life uses for one or more southeastern reservoirs. *Due 6 months after QAPP approval.*

Task 3 Deliverable (3b). Draft final report on approaches for developing numeric nutrient criteria that support identified nutrient-sensitive human and aquatic life uses for one or more southeastern reservoirs. *Due 11 months after QAPP approval.*

Task 4. Develop watershed models or other analytical approaches for deriving numeric nutrient criteria for flowing waters that will support attainment of identified numeric criteria and aquatic life uses in downstream lakes in the upper midwest.

In this task the Contractor shall devise and implement an analytical approach, possibly including watershed simulation models, to develop numeric nutrient criteria for streams in the watershed of one or more upper midwest lakes that, if achieved, would provide an expectation of attainment of nutrient criteria and associated nutrient-sensitive uses in the downstream receiving lake. These are referred to as "downstream protection values" or "DPVs." In this task, the primary focus is identification, discussion, analysis and possible solution of important technical issues related to development of DPVs, since the goal is to develop an approach, not criteria that will be proposed for the specific lake. Thus, the contractor shall (1) develop the approach, (2) identify possible problems, key areas of uncertainty, and possible solutions, and (3) suggest additional research that could reduce uncertainty and promote eventual adoption of the methods by regulatory agencies.

Task 4 Deliverable (4a). Six-month progress report on development of watershed models or other analytical approaches for deriving DPVs for the watershed of one or more upper midwest lakes. *Due 6 months after QAPP approval.*

Task 4 Deliverable (4b). Draft final report on development of watershed models or other analytical approaches for deriving DPVs for the watershed of one or more upper midwest lakes. *Due 11 months after QAPP approval.*

Task 5. Develop watershed models or other analytical approaches for deriving numeric nutrient criteria for flowing waters that will support attainment of identified numeric criteria and aquatic life uses in downstream lakes in the upper midwest.

In this task the Contractor shall devise and implement an analytical approach, possibly including watershed simulation models, to develop numeric nutrient criteria for streams in the watershed of one or more southeastern reservoirs that, if achieved, would provide an expectation of attainment of nutrient criteria and associated nutrient-sensitive human and aquatic life uses in the downstream receiving lake(s). These are referred to as "downstream protection values" or "DPVs." In this task, the primary focus is as in Task 4. Thus, the contractor shall (1) develop the approach, (2) identify possible problems, key areas of uncertainty, and possible solutions, and (3) suggest additional research that could reduce uncertainty and promote eventual adoption of the methods by regulatory agencies.

Task 5 Deliverable (5a). Six-month progress report on development of watershed models or other analytical approaches for deriving DPVs for the watershed of one or more southeastern reservoirs. *Due 6 months after QAPP approval.*

Task 5 Deliverable (5b). Draft final report on development of watershed models or other analytical approaches for deriving DPVs for the watershed of one or more southeastern reservoirs. *Due 11 months after QAPP approval.*

Task 6. Complete Final Project Report and Present Findings to ORD and OW audience via Webinar.

The Contractor shall address EPA comments regarding the Draft Final Report, consisting of deliverables 2b, 3b, 4b, and 5b and produce an integrated final report addressing the goals of all tasks under this Work Assignment.

Task 7. Meetings and Monthly Reports

Within 5 days of receipt of the work assignment, the Contractor shall schedule a conference call with the WAM to discuss and clarify the objectives and specific tasks of this work assignment. Meetings or conference calls shall occur monthly to resolve uncertainties or correct problems that may occur. The frequency of these meetings or conference calls may be adjusted according to the needs of the project, and the Contractor shall initiate additional communication with the WAM should developments arise that will affect the conduct or schedule of tasks. The Contractor shall prepare very brief minutes of meetings with the EPA staff and monthly status reports. The EPA will review the minutes to ensure that an accurate record of the communications has been made and filed and that any specific "action items" identified during

the meeting are noted.

At the mid-point of the project, the Contractor shall travel to EPA's facility in Gulf Breeze, FL to participate in a mid-year review of progress. Subject to mutual agreement by EPA and the contractor, the mid-year meeting may be held at an alternate location.

Task 7 Deliverable. The contractor shall assemble and provide to EPA any presentation materials from the mid-year project review meeting.

CONFLICT OF INTEREST:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

MANAGEMENT CONTROLS:

1. The EPA will review and provide comments on the Work Plan and QAPP.
2. The EPA will also review and provide comments on the subsequent module outlines, module drafts, and conceptual models for each of the candidate causes.
3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.
4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be

issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

The WAM/COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS WORK ASSIGNMENT:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 1-12	
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2014 Title of Work Assignment/SF Site Name Methods for Computing Downstre	
Contractor TETRA TECH, INC.		Specify Section and paragraph of Contract SOW	
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Amendment <input checked="" type="checkbox"/> Work Plan Approval		<input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Incremental Funding Period of Performance From 09/30/2013 To 09/29/2014	
Comments:			
<input type="checkbox"/> Superfund		Accounting and Appropriations Data	
		<input checked="" type="checkbox"/> Non-Superfund	
Note: To report additional accounting and appropriations date use EPA Form 1900-69A.			
SFO (Max 2) <input type="checkbox"/>			
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)
			Budget Org/Code (Max 7)
			Program Element (Max 9)
			Object Class (Max 4)
			Amount (Dollars)
			(Cents)
			Site/Project (Max 8)
			Cost Org/Code (Max 7)
1			
2			
3			
4			
5			
Authorized Work Assignment Ceiling			
Contract Period:		Cost/Fee: \$0.00	
09/30/2012 To 09/29/2014		LOE: 0	
This Action:		\$200,412.00	
		2,000	
Total:		\$200,412.00	
		2,000	
Work Plan / Cost Estimate Approvals			
Contractor WP Dated: 11/13/2013		Cost/Fee: \$200,412.00	
		LOE: 2,000	
Cumulative Approved:		Cost/Fee: \$200,412.00	
		LOE: 2,000	
Work Assignment Manager Name Jim Hagy		Branch/Mail Code:	
_____ (Signature)		_____ (Date)	
		Phone Number 850-934-2455	
		FAX Number:	
Project Officer Name Sharon Boyde		Branch/Mail Code:	
_____ (Signature)		_____ (Date)	
		Phone Number: 703-347-8576	
		FAX Number: 703-374-8696	
Other Agency Official Name		Branch/Mail Code:	
_____ (Signature)		_____ (Date)	
		Phone Number:	
		FAX Number:	
Contracting Official Name Mark Cranley		Branch/Mail Code: CPOD	
_____ (Signature)		_____ (Date)	
		Phone Number: 513-487-2351	
		FAX Number: 513-487-2109	

EPAUnited States Environmental Protection Agency
Washington, DC 20460**Work Assignment**

Work Assignment Number

1-13

☐ Other ☐ Amendment Number:

Contract Number

EP-C-12-060

Contract Period 09/30/2012 To 09/29/2014

Base Option Period Number 1

Title of Work Assignment/SF Site Name

Stormwater Design Guide

Contractor

TETRA TECH, INC.

Specify Section and paragraph of Contract SOW

2c

Purpose:



Work Assignment



Work Assignment Close-Out



Work Assignment Amendment



Incremental Funding



Work Plan Approval

Period of Performance

From 09/30/2013 To 09/29/2014

Comments:



Superfund

Accounting and Appropriations Data



Non-Superfund

SFO
(Max 2)

Note: To report additional accounting and appropriations data use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:

09/30/2012 To 09/29/2014

Cost/Fee:

LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated:

Cost/Fee:

LOE:

Cumulative Approved:

Cost/Fee:

LOE:

Work Assignment Manager Name Susan Julius

(Signature)

(Date)

Branch/Mail Code:

Phone Number 703-347-8619

FAX Number:

Project Officer Name Sharon Boyde

(Signature)

(Date)

Branch/Mail Code:

Phone Number: 703-347-8576

FAX Number: 703-374-8696

Other Agency Official Name

(Signature)

(Date)

Branch/Mail Code:

Phone Number:

FAX Number:

Contracting Official Name Mark Cranley

(Signature)

(Date)

Branch/Mail Code: CPOD

Phone Number: 513-487-2351

FAX Number: 513-487-2109

**Performance Work Statement
Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No 1-13**

I. Title: Climate Change and Urban Stormwater Design Guide

II. Period of Performance: 12/05/2013 through September 29, 2014

III. Work Assignment Manager:

Susan Julius
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8619 (phone)
703-347-8694 (fax)
Julius.susan@epa.gov

Alternate WAM:

Britta Bierwagen, PhD
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8613
bierwagen.britta@epa.gov

IV. Total Estimated LOE: 902 hours

V. Introduction:

The EPA Office of Research and Development Global Change Research Program (GCRP) works to build the capacity of EPA program and regional offices, water managers, and other decision-makers to assess and respond to global change impacts on water quality and aquatic ecosystems. Research and assessment activities in the GCRP Water Quality focus area broadly support EPA's mission and responsibilities as defined by the Clean Water Act and the Safe Drinking Water Act.

During the last century, much of the U.S. experienced climate change including warming temperatures, increases in precipitation, and increases in the intensity of precipitation events. On top of these large scale shifts are regional and local changes in land use and land cover from urbanization that can also greatly impact urban watersheds. These can interact to yield complex responses on urban water quantity and quality through pulse events, drying/wetting processes, as well as urban practices related to green-spaces (e.g. what is planted and how is it managed).

The potential effects of climate change on watershed hydrology are increasingly well documented. Climate change will have dramatic impacts on water resources, altering precipitation in terms of the amount, timing, and type (e.g. rain versus snow). Increasing air temperature will increase evapotranspiration and possibly net primary productivity in many ecosystems, further affecting water balances locally and regionally. Much less is known about how local and meso-scale decisions in urban and urbanizing areas will interact with these biophysical phenomena to impact water resources. Together, these drivers will lead to numerous cascading effects on water quality, aquatic habitat, and water supply.

The primary method to control urban stormwater is the use of best management practices (BMPs). Traditional grey stormwater infrastructure generally uses single-purpose, hard structures including detention basins and storm sewers to dispose of rainwater. Green infrastructure uses vegetation and soil to manage rainwater where it falls. Green Infrastructure (GI) provides many ecosystem services to city dwellers, including reduced heat loads for human health and reduced energy demand, stormwater infiltration and retention, carbon and nitrogen sequestration, and habitat for biodiversity. Municipalities are getting more and more interested in integrating GI into their traditional “grey” infrastructure because of (1) co-benefits provided that grey infrastructure cannot provide, (2) cost savings, and (3) the flexibility that green infrastructure provides versus grey.

This Work Assignment is for developing a design guide for green and grey stormwater controls that identifies regionally relevant factors that affect urban stormwater control efficiencies given the interaction of climate driven changes (e.g., temperature, precipitation, extreme events) with other changes (e.g., land use change), and methods for adjusting or changing designs to maintain efficiencies. Key objectives of this effort are to (1) review the scientific and grey literature to identify key variables that affect green and grey infrastructure performance, including climate variability and change, and how those key variables change across the country using a relevant categorization scheme, (2) where possible, develop response curves for identified key variables and storm size, (3) develop an urban stormwater vulnerability and design guide that brings together information on key variables, response curves (or thresholds) and climate change to inform modeling and design of urban stormwater BMPs, and (4) prepare written and/or web products for publication.

Potential data sources include case studies and papers that have (1) applied Robust Decision Making to climate change and water quality issues, such as GCRP’s case studies on the Patuxent and Illinois rivers, (2) applied the SUSTAIN, RHESSys, BMP-DSS, HydroCAD, SWMM or other relevant models to look explicitly at climate change or to look at other sensitivities in BMP responses due to changes in land use, flow or volume, seasonal variability, or that look at how BMP effectiveness or design changes across a set of locations.

VII. Specific Tasks and Deliverables:

Task 1 – Establish Communication, Prepare Workplan, and Prepare QAPP

SubTask 1.1. Establish communication with the WAM and develop a regular reporting schedule. Within 3 days of start date of this WA and over the course of 30 days, the Contractor shall schedule a series of weekly conference calls (not to exceed 1 hour) or at the frequency requested by the WAM, with the WAM and appropriate contractor staff to clarify outstanding questions and confirm the schedule and specific tasks.

In collaboration with the WAM, the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Work Assignment.

Deliverable 1.1.A: Brief, written progress reports as email to the WAM. Due monthly or upon request by the WAM for the duration of this Work Assignment.

Deliverable 1.1.B: Project meetings and other communications, such as conference calls, as needed. Due upon request by the WAM for the duration of this Work Assignment.

Subtask 1.2 Prepare Work Plan, Staffing Plan, and Quality Assurance Project Plan (QAPP)

The Contractor shall have 30 days to prepare a Technical Work Plan describing how the work outlined in this Performance Work Statement will be performed, including deliverables, a schedule, budget, and level of effort. The Contractor shall also prepare a Staffing Plan, which shall be submitted as part of the Work Plan that shows assigned personnel by task and the qualifications of the proposed personnel. The Contractor shall provide expertise in the basic science areas required to complete this work assignment.

The Contractor shall develop a QAPP for approval by the WAM and Quality Assurance Manager. The Contractor must address in the QAPP how they are going to consider the use of secondary data to carry out this task. Secondary data are defined as environmental or health data that were developed for a different purpose. This includes data used from citations found in the literature. See these documents: "EPA Manual C/O 2105-P-01-0: EPA Quality Manual for Environmental Programs (QAPP)"; "EPA Requirements for Quality Assurance Project Plans (QA/R-5)"; and "Appendix A. Guidance on Quality Assurance Project Plans for Secondary Research Data."

The QAPP shall be submitted simultaneously with the Work Plan for approval. The Contractor shall not perform any work on subsequent tasks under this Work Assignment until the Work Plan and QAPP are reviewed and approved.

Deliverable 1.2.A: A draft workplan submitted to the WAM for review. Due 30 days after award.

Deliverable 1.2.B: A final workplan addressing WAM comments on the draft submitted to the WAM for approval. Due 1 week after receiving WAM comments on the draft workplan.

Deliverable 1.2.C: A draft QAPP submitted to the WAM for review. Due 30 days after award.

Deliverable 1.2.D: A final QAPP addressing WAM comments on the draft submitted to the WAM for approval. Due 1 week after receiving WAM comments on the draft QAPP.

Task 2 - Conduct Review of Grey and Scientific Literature

The contractor shall conduct a thorough review of grey literature and peer reviewed scientific literature that addresses the sensitivity and lifetime of urban green and grey stormwater infrastructure to climate change and to other relevant and/or related changes (e.g., land use change, changes in precipitation intensity, flow, volume, seasonal variations, or geographic differences). From the literature and other relevant sources, the Contractor shall identify (1) the key variables that influence BMP sensitivities, (2) how these variables change across hydroclimatic or ecoregional classifications or some other

classification system, and whether there are identifiable thresholds for those key variables that would necessitate BMP redesign or change in type (e.g., infiltration versus treatment). The Contractor shall build on the literature review conducted for GCRP's work assignment assessing sensitivity of GI performance to climate change (Tom Johnson is the WAM). The Contractor shall prepare the literature review to be included as part of the introduction and methods section of the journal article prepared under Task 3. The contractor shall provide pdf versions of all relevant literature to the WAM.

Deliverable 2.A: Memo with compiled list of literature sources and brief description of relevancy. Due 4 weeks after workplan approval.

Deliverable 2.B.: Draft intro and methods memo. Due to the WAM 4 weeks after Deliverable 2.A.

Deliverable 2.C: Final intro and methods memo addressing WAM comments. Due 2 weeks after receiving WAM comments on Deliverable 2.A.

Task 3 – Identify and develop response curves, thresholds, and design modifications for BMPs

Based on the literature review in Task 2 and GCRP's other work assignment, the Contractor shall suggest suitable datasets (e.g., monitoring datasets) and studies with which to (1) develop response curves of BMP effectiveness by event size and other variables; (2) identify thresholds in BMP performance; (3) develop BMP design alterations or changes that maintain urban stormwater runoff targets based on response curves or thresholds; and (4) identify tradeoffs and benefits (GI vs. grey infrastructure strategies) including innovative uses of stormwater, to understand implications of choices beyond differences in removal efficiencies (e.g., urban agriculture). The Contractor shall also identify gaps in knowledge identified while carrying out (1) through (4) above. It is anticipated that the number of locations having data sufficient to develop response curves will be limited. If response curves cannot be developed, the Contractor shall propose alternatives. Findings from tasks 2 and 3 shall be compiled into an article suitable for publication in a peer-reviewed journal.

Deliverable 3.A. Draft memo with list of suitable datasets, studies, and key variables. Due 4 weeks after Deliverable 2.C. Final memo with list due 2 weeks after receiving comments from WAM.

Deliverable 3.B. Conference call with WAM and relevant EPA staff to discuss Deliverable 3.A. Due 1 week after Deliverable 3.A.

Deliverable 3.C. Draft article for internal review describing response curves, thresholds, design modifications, and tradeoffs/benefits. Due 8 weeks after Deliverable 3.B.

Deliverable 3.D. Final article for journal submission describing response curves, thresholds, design modifications, and tradeoffs/benefits and responses to internal review comments. Due 4 weeks after receiving internal review comments from the WAM.

Task 4 – Propose structure for stormwater vulnerability and planning (design) guide

The draft proposal shall be developed in consultation with the WAM and relevant EPA Program and Regional offices. Based on this consultation, the Contractor shall propose a suitable structure to develop a stormwater vulnerability and planning (design) guide that incorporates information from Tasks 2 and 3. The structure should address the significance and treatment of key variables for both modeling and

design of stormwater BMPs. The guide shall accommodate variations in degree of knowledge, transferability, and generalizability across and within the classification system chosen (Task 2). In other words, the structure needs to be flexible to accommodate variations in information across municipalities, climate change, and geomorphology.

The Contractor shall explore the specific format of the guide, e.g., completely web-based vs. downloadable guidebook, or some combination thereof. The Contractor shall include considerations about the ease of updating the guide with new information.

Deliverable 4.A: Meeting (half-day, in person) with WAM and relevant EPA stakeholders to develop draft proposal for guide structure and format. Due within 2 weeks of WAM's acceptance of Deliverable 3.D.

Deliverable 4.B: Draft structure and format of guide based on Deliverable 4.A. Due 2 weeks after Deliverable 4.A.

Deliverable 4.C: Tele- or web-conference with WAM and relevant EPA stakeholders to review and comment on Deliverable 4.B. Due within 2 weeks of receiving comments from WAM on Deliverable 4.B.

Deliverable 4.D: Final structure and format of guide based on Deliverable 4.C. Due 2 weeks after Deliverable 4.C.

Task 5 – Develop content based on structure and format in Task 4

The Contractor shall develop the content based on Tasks 2 and 3 and populate the structure using the format agreed upon in Task 4. Deliverables under this task shall be presented to the WAM and relevant EPA stakeholders (as in Task 4) and revised as necessary before sending the content for internal and external review.

Deliverable 5.A: Draft guide based on final structure of Deliverable 4.D. Due 6 weeks after Deliverable 4.D. Revised guide due 2 weeks after receiving WAM's comments on draft.

Deliverable 5.B: Meeting (in person or tele- or web-conference) with WAM and relevant EPA stakeholders to review Deliverable 5.A. Due within 2 weeks of submitting Deliverable 5.A.

Deliverable 5.C: Internal review draft of guide based on comments received under Deliverable 5.B. Due 2 weeks after Deliverable 5.B.

Deliverable 5.D: Revised guide for external review and document of responses to internal review comments. Due 4 weeks after receipt of internal review comments from WAM.

Deliverable 5.E: Revised guide for final publication and document of responses to external review comments. Due 4 weeks after receipt of external review comments from WAM.

VIII. Schedule of Milestones and Deliverables:

Task No.	DELIVERABLE	Schedule
1	1.1.A. Progress reports	Due monthly
1	1.1.B. Other communication	Due upon request by the WAM
1	1.2.A. Draft workplan	Due 30 days after award
1	1.2.B. Final workplan	Due 1 week after receiving WAM comments
1	1.2.C. Draft QAPP	Due 30 days after award
1	1.2.D. Final QAPP	Due 1 week after receiving WAM comments
2	2.A. Overview memo of literature review results	Due 4 weeks after workplan approval
2	2.B. Draft intro and methods memo	Due 4 weeks after Deliverable 2.A.
2	2.C. Final intro and methods memo	Due 2 weeks after receiving WAM comments
3	3.A. Draft and final memo	Draft due 4 weeks after Deliverable 2.C. Final due 2 weeks after receiving WAM comments
3	3.B. Conference call	Due 1 week after Deliverable 3.A.
3	3.C. Draft article	Due 8 weeks after Deliverable 3.B.
3	3.D. Final article	Due 4 weeks after receiving internal review comments
4	4.A. Half-day Meeting on guide structure and format	Due 2 weeks after Deliverable 3.D.
4	4.B. Draft structure and format for Guide	Due 2 weeks after Deliverable 4.A.
4	4.C. Tele-/web-conference	Due 2 weeks after receiving WAM comments on 4.B.
5	4.D. Final structure and format for Guide	Due 2 weeks after Deliverable 4.C.
5	5.A. Draft Guide	Due 6 weeks after Deliverable 4.D.
5	5.B. Meeting	Due 2 weeks after Deliverable 5.A.
5	5.C. Internal review draft Guide	Due 2 weeks after Deliverable 5.B.
5	5.D. External review draft Guide	Due 4 weeks after receipt of internal review comments
5	5.E. Final Guide	Due 4 weeks after receipt of external review comments

IX. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

X. Conflict of Interest:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

XI. Management Controls:

1. The EPA will review and provide comments on the Work Plan and QAPP.
2. The EPA will also review and provide comments on subsequent deliverables.
3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.
4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

The WAM/COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

XII. Notice Regarding Guidance Provided Under This Work Assignment:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPAUnited States Environmental Protection Agency
Washington, DC 20460**Work Assignment**

Work Assignment Number

1-13

☐ Other ☐ Amendment Number:

Contract Number

EP-C-12-060

Contract Period 09/30/2012 To 09/29/2014

Base Option Period Number 1

Title of Work Assignment/SF Site Name

Climate Change and Urban Storm

Contractor

TETRA TECH, INC.

Specify Section and paragraph of Contract SOW

Purpose:



Work Assignment



Work Assignment Close-Out



Work Assignment Amendment



Incremental Funding



Work Plan Approval

Period of Performance

From 09/30/2013 To 09/29/2014

Comments:



Superfund

Accounting and Appropriations Data



Non-Superfund

Note: To report additional accounting and appropriations data use EPA Form 1900-69A.

SFO
(Max 2)

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:

09/30/2012 To 09/29/2014

Cost/Fee: \$0.00

LOE: 0

This Action:

\$101,292.00

952

Total:

\$101,292.00

952

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 12/20/2013

Cost/Fee: \$101,292.00

LOE: 952

Cumulative Approved:

Cost/Fee: \$101,292.00

LOE: 952

Work Assignment Manager Name Susan Julius

Branch/Mail Code:

(Signature)

(Date)

Phone Number 703-347-8619

FAX Number:

Project Officer Name Sharon Boyde

Branch/Mail Code:

(Signature)

(Date)

Phone Number: 703-347-8576

FAX Number: 703-374-8696

Other Agency Official Name

Branch/Mail Code:

(Signature)

(Date)

Phone Number:

FAX Number:

Contracting Official Name Mark Cranley

Branch/Mail Code: CP00

(Signature)

(Date)

Phone Number: 513-487-2351

FAX Number: 513-487-2109

EPAUnited States Environmental Protection Agency
Washington, DC 20460**Work Assignment**

Work Assignment Number

1-14

☐ Other ☐ Amendment Number:

Contract Number

EP-C-12-060

Contract Period 09/30/2012 To 09/29/2014

Base Option Period Number 1

Title of Work Assignment/SF Site Name

Literature Review and Modeling

Contractor

TETRA TECH, INC.

Specify Section and paragraph of Contract SOW

2g

Purpose:



Work Assignment



Work Assignment Close-Out



Work Assignment Amendment



Incremental Funding



Work Plan Approval

Period of Performance

From 09/30/2013 To 09/29/2014

Comments:



Superfund

Accounting and Appropriations Data



Non-Superfund

SFO
(Max 2)

Note: To report additional accounting and appropriations data use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:

09/30/2012 To 09/29/2014

Cost/Fee:

LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated:

Cost/Fee:

LOE:

Cumulative Approved:

Cost/Fee:

LOE:

Work Assignment Manager Name Thomas Johnson

Branch/Mail Code:

Phone Number 703-347-8618

FAX Number:

(Signature)

(Date)

Project Officer Name Sharon Boyde

Branch/Mail Code:

Phone Number: 703-347-8576

FAX Number: 703-374-8696

(Signature)

(Date)

Other Agency Official Name

Branch/Mail Code:

Phone Number:

FAX Number:

(Signature)

(Date)

Contracting Official Name Mark Cranley

Branch/Mail Code: CP0D

Phone Number: 513-487-2351

FAX Number: 513-487-2109

(Signature)

12/17/13
(Date)

**Performance Work Statement
Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment 1-14**

I. Title: Literature Review and Modeling to Assess the Sensitivity of Green Infrastructure Performance to Climate Change in Urban Systems

II. Period of Performance: Award through September 29, 2014 (Begins contract OY-1; Carried over to OY-2)

III. Work Assignment Manager:

Thomas Johnson, Ph.D.
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8618 (phone)
703-347-8694 (fax)
johnson.thomas@epa.gov

Alternate WAM:

Christopher Clark, Ph.D.
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8665
clark.christopher@epa.gov

IV. Total Estimated LOE: 953 hours

V. Introduction:

The EPA Office of Research and Development Global Change Research Program (GCRP) works to build the capacity of EPA program and regional offices, water managers, and other decision-makers to assess and respond to global change impacts on water quality and aquatic ecosystems. Research and assessment activities in the GCRP Water Quality focus area broadly support EPA's mission and responsibilities as defined by the Clean Water Act and the Safe Drinking Water Act.

During the last century, much of the U.S. experienced climate change including warming temperatures, increases in precipitation, and increases in the intensity of precipitation events. On top of these large scale climatic shifts are regional and local changes in land use and land cover from urbanization. These two drivers individually and interactively can impact urban water quantity and quality through several processes. These include pulse events, drying/wetting processes, variable infiltration from green cover versus impervious cover, evapotranspiration, as well as engineered conveyance via grey infrastructure. Understanding the total effects from global change on water resources in urban areas requires a synthesis of these two drivers.

The potential effects of climate change on watershed hydrology are increasingly well documented. Climate change will have dramatic impacts on water resources, altering precipitation in terms of the amount, timing, and type (e.g. rain versus snow). Increasing air temperature will increase evapotranspiration and possibly net primary productivity in many ecosystems, further affecting water balances locally and regionally. Much less known is how local and meso-scale decisions in urban and urbanizing areas will interact with these biophysical phenomena to impact water resources. Together, these drivers will lead to numerous cascading effects on water quality, aquatic habitat, and water supply.

The primary method to control urban stormwater is the use of best management practices (BMPs). Traditional grey stormwater infrastructure generally uses single-purpose, hard structures including detention basins and storm sewers to dispose of rainwater. Green infrastructure (GI) uses vegetation and soil to manage rainwater where it falls. Green Infrastructure provides many additional ecosystem services to city dwellers, including reduced heat loads for human health and reduced energy demand, carbon and nitrogen sequestration, and habitat for biodiversity. Municipalities are increasingly focusing on integrating GI into their traditional grey infrastructure because of (1) co-benefits provided that grey infrastructure cannot provide, (2) cost savings, and (3) the flexibility that green infrastructure provides versus the hard structures of grey infrastructure.

This Work Assignment is for conducting dynamic modeling to examine the potential effects of climate change on urban stormwater management using GI. Key objectives of this effort are to (1) review the scientific literature concerning the performance of different GI practices and their sensitivity to climate variability and change, (2) setup a suitable model and conduct stormwater modeling to establish the baseline performance of urban stormwater management (green and grey) under current climate for several different model city archetypes, (3) examine how that performance will change under future climate conditions, (4) explore various management strategies for maintaining or enhancing GI performance under future climate, and (5) conduct data analysis and prepare written products for publication based on modeling results.

Completing the Tasks outlined in this Work Assignment will require 1) identification of the major variables controlling urban stormwater and GI sensitivity to climate change, 2) choosing a group of well studied and monitored systems to use as the basis for development of urban system ‘archetypes’ that represent these dynamics and 3) applying a dynamic modeling approach to characterize the responses of pre-selected urban system archetypes. A key question to be determined is the scale at which urban archetypes are defined (e.g., city block, several blocks, other). Place-based modeling of existing cities will not be required. Results of this effort will contribute to 2 written manuscripts that discuss the sensitivity of urban stormwater management using GI in different archetype settings.

Related and Supporting GCRP Projects

EPA has developed mid-21st century climate change and urban and residential development scenarios that are available but not required for use in this project. Other sources of climate scenarios are easily available. Final selection of scenarios will be determined in consultation with the COR. Existing scenarios available from EPA are described below.

The EPA GCRP has partnered with the North American Regional Climate Change Assessment Project (NARCCAP), which. NARCCAP provides detailed scenarios of regional climate change over the U.S. in a form suitable for driving basin-scale hydrologic models and for use in impacts assessments. More information about NARCCAP can be found at <http://www.narccap.ucar.edu/>. In addition to NARCCAP, other existing scenarios are available from four the Coupled Model Intercomparison Project Phase 3

(CMIP3) data (served at http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/). These scenarios are downscaled using bias-corrected and spatially downscaled (BCSD) techniques.

Land use scenarios are available from EPA's Integrated Climate and Land Use Scenarios (ICLUS) project. ICLUS has developed seamless, national-scale land use change scenarios compatible with the IPCC emissions storylines underlying NARCCAP and other GCM climate change projections. ICLUS provides decadal projections of changes in housing density and impervious cover throughout the contiguous U.S. through the year 2100.

VI. Specific Tasks and Deliverables:

Task 1 – Prepare Workplan, Establish Communication, and Prepare QAPP

SubTask 1.1. Prepare Work Plan and Cost Estimate

The Contractor shall prepare a work plan in response to this work assignment, outlining the proposed approach, expertise and staffing, and resources needed, and a schedule to complete each task. The work plan should identify potential data and tools needed and any potential problems that might be encountered during the execution of the work assignment.

SubTask 1.2. Establish communication with the COR and develop a regular reporting schedule

The Contractor shall contact the COR and schedule a kickoff project meeting. In collaboration with the COR the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Work Assignment.

Deliverable 1.2.A: Brief, written progress reports as email to the COR. Due monthly or upon request by the COR for the duration of this Work Assignment.

Deliverable 1.2.B: Project meetings and other communications, such as conference calls, as needed. Due upon request by the COR for the duration of this Work Assignment.

SubTask 1.3. Develop a QAPP

All work conducted under this Work Assignment shall be performed pursuant to an EPA approved Quality Assurance Project Plan (QAPP). The contractor shall develop a Quality Assurance Project Plan within 30 days after project start for review and approval by the TOM and the EPA QA Officer. The QAPP shall outline the approach and measures the Contractor will implement to ensure a high standard of quality in data analysis and written deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). Portions of this Work Assignment relevant to modeling will reference *Guidance for Quality Assurance Project Plans for Modeling* (EPA QA/G-5M), while portions of this Work Assignment relevant to geospatial data will reference *Guidance for Quality Assurance Project Plans for Geospatial Data* (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this Work Assignment.

Deliverable 1.3.A: A draft QAPP submitted to the COR for review. Due 2 weeks after award.

Deliverable 1.3.B: A revised QAPP addressing COR comments on the draft submitted to the COR for approval. Due 1 week after approval of Deliverable 1.3.A.

Task 2 - Conduct Literature Review

The contractor shall conduct a thorough review of the peer reviewed scientific literature addressing the sensitivity of urban stormwater management using green infrastructure to climate change and prepare a written white paper describing results.

SubTask 2.1. Conduct a literature review

The contractor shall conduct a targeted review of the peer reviewed scientific literature to addresses the following questions:

- (1) what are the major urban (i.e., biophysical, population/housing density, amount and pattern of greenspace, etc.) and climatic variables controlling the performance of green infrastructure. Here “performance” is primarily defined as urban stormwater management, and secondarily as other ecosystem services provided by GI (i.e. carbon and nitrogen sequestration, cooling, and habitat for urban biodiversity).
- (2) what are the observed, projected, or potential effects of climate variability and change on the performance of urban stromwater management in different urban settings using green infrastructure
- (3) what opportunities and barriers are there for using green infrastrucrture to manage urban stormwater stormwater to adapt to climate change in U.S. cities.

The contractor shall prepare a draft white paper discussing the questions listed above based on and citing all relevant literature and submit to the COR for comment and approval. The white paper shall be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. After receiving COR comments on the draft, the contractor shall address all COR comments to prepare a final draft manuscript and submit to the COR for approval. The contractor shall provide pdf versions of all relevant literature to the COR.

Deliverable 2.1.A: A draft white paper discussing the literature on the 3 questions enumerated above. Due to the COR 12 weeks after award.

Deliverable 2.1.B: A final white paper discussing the literature on the 3 questions enumerated above and addressing COR comments on Deliverable 2.1.A. Due 4 weeks after receiving COR comments on Deliverable 2.1.A.

Task 3 – Develop Archetypes for Urban Subunits

The Contractor shall develop idealized archetypes to describe city “subunits”. Archetypical urban subunits (AUSs) will be developed in consultation with the WAM. The AUSs will later be used to connect analytical results of idealized subunits to actual U.S. cities, and thus should be partially based on an understanding of U.S. urban areas. We anticipate between 6-27 AUSs in total. These subunits may be stratified along 2-3 axes to differentiate types. For example, the Contractor in consultation with the WAM may decide that 3-axes (i.e. degree of impervious cover, infiltration of soil, average slope) with 3-levels each is optimal, for a total of 27 subunits. Alternative to stratification, the subunits may simply reflect idealized neighborhoods of a city such as residential, downtown, and mixed, with varying degrees of GI.

These archetypes will form the analytical subunits for the subsequent simulations. The Contractor should leverage activities in EPA on “city typology” in determining AUSs (EPA/ORD, Safe and Healthy Communities National Program, Community Typology Project, Task Lead: Michael Nye, NCER), as well as the published literature, among other resources.

Deliverable 3.1.A: A memo describing options for defining idealized city subunits. Due 4 weeks after approval of Deliverable 2.1.A.

Deliverable 3.1.B: A first draft white paper describing AUSs, their basic properties, and how they generally connect with real U.S. cities. Due 2 weeks after approval of Deliverable 3.1.A.

Deliverable 3.1.C: A second draft white paper describing AUSs, their basic properties, how they generally connect with real U.S. cities, and a Case Study for one specific U.S. city (e.g. describing how Milwaukee can be approximated by a specific combination of AUSs). Due 2 weeks after approval of Deliverable 3.1.B.

Task 4 - Simulation Modeling to Assess Performance of Urban GI under current and future conditions

The Contractor shall conduct simulation modeling to assess the performance of urban subunits (AUSs) to current and future climate and management conditions. The Contractor will use a modeling framework capable of analyzing effects from different types of land use on water resources and biogeochemistry of urban watersheds (e.g. RHESSys, <http://fiesta.bren.ucsb.edu/~rhessys/>). The Contractor shall, in consultation with the WAM, develop a design memo that describes the number and type of simulations to be run. It is estimated that approximately 5 climate scenarios will be needed in conjunction with approximately 6-27 AUSs, and 2-4 management strategies, for a total of 60-540 simulations. The exact numbers of simulations will be determined in consultation with the COR and will take into account feasibility and level of effort for run multiple simulations.

SubTask 4.1. Develop an analysis plan for simulation modeling to address study goals

The contractor shall, in consultation with the COR, develop a proposed analysis plan for simulation modeling to address study goals. The contractor shall prepare a Design Memo that specifies the selected stormwater model and rationale for model selection, the climate change scenarios to be evaluated, the AUSs to be evaluated and rationale for the selected urban archetypes, and other relevant information concerning the specific set of model simulations to be conducted to address study goals. The Contractor shall submit the design memo to the COR for review and approval.

Deliverable 4.1.A: A draft memo describing the proposed analysis plan submitted to the COR for approval. Due 2 weeks after approval of Deliverable 3.1.B.

Deliverable 4.1.B: A final memo describing the analysis plan submitted to the COR. Due 2 weeks after approval of Deliverable 4.1.A.

Subtask 4.2. Complete model set-up, calibration, validation and baseline simulations under current climate conditions

The Contractor shall acquire all necessary input data, setup, calibrate (if necessary) and validate the selected stormwater model described in the design memo in Deliverable 4.1.A. The Contractor shall also conduct baseline model simulations of GI performance in the different AUSs under current/historical climate conditions.

Deliverable 4.2.A. Results of simulation modeling in MS Excel format. Due 8 weeks after approval of Deliverable 4.1.B.

Subtask 4.3. Conduct model simulations under future climate conditions and management strategies

The Contractor shall acquire all necessary input data, setup, and run model simulations described in the design memo in Deliverable 4.1.A. The Contractor shall also prepare summary statistics and conduct other data analysis to characterize the results from the simulations.

Deliverable 4.3.A. Results of simulation modeling in MS Excel format. Due 8 weeks after approval of Deliverable 4.2.A.

Deliverable 4.3.B. Brief presentation (30-45 min) giving an overview of simulation modeling results in .ppt or .pdf format. Due 4 weeks after approval of Deliverable 4.3.A.

Task 5. Prepare 2 Written Manuscripts for Publication

The Contractor shall prepare written manuscripts describing the modeling methodology and results, and conduct data analysis as necessary to complete 2 manuscripts for submission to peer reviewed journals for publication.

SubTask 5.1. Prepare a written manuscript based on modeling results discussing the potential effects of climate change on urban stormwater management using GI.

In consultation with the WAM, the Contractor shall prepare a written manuscript (approximately 20-30 single-spaced pages excluding figures/tables) discussing the potential effects of climate change on urban stormwater management using GI. The manuscript shall be written in the format of a peer reviewed scientific journal to be specified by the COR, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. Information from the literature review in Task 2 can be adapted as introduction and other sections of the manuscript as appropriate. The Contractor shall prepare a first draft manuscript and submit to the COR for review. The Contractor shall revise the first draft to address COR comments and submit a second and final draft to the COR for approval.

Deliverable 5.1.A. A proposed outline for manuscript discussing the potential effects of climate change on urban stormwater management using GI. Due 2 weeks after approval of Deliverable 4.3.B.

Deliverable 5.1.B: A first draft manuscript discussing the potential effects of climate change on urban stormwater management using GI submitted to the COR for review. Due 6 weeks after approval of Deliverable 5.1.A.

Deliverable 5.1.C: A second draft manuscript addressing COR comments on the first draft submitted to the COR. Due 4 weeks after receiving COR comments on Deliverable 5.1.B.

SubTask 5.2. Prepare a written manuscript discussing opportunities and barriers to stormwater management using GI to adapt to climate change in U.S. cities which includes one Case Study.

In consultation with the WAM, the Contractor shall prepare a written manuscript (approximately 20-30 single-spaced pages excluding figures/tables) presenting and discussing opportunities and barriers to stormwater management using GI to adapt to climate change in U.S. cities. The manuscript shall include (i) a general description/framework of how the modeling results from SubTask 5.1 can be applied to U.S. cities, and (ii) one Case Study applying that description/framework to one U.S. city. The manuscript shall be written in the format of a peer reviewed scientific journal to be specified by the COR, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. Information from the literature review in Task 2 can be adapted as introduction and other sections of the manuscript as appropriate. The Contractor shall prepare a first draft manuscript and submit to the COR for review. The Contractor shall revise the first draft to address COR comments and submit a second and final draft to the COR for approval.

Deliverable 5.2.A. A proposed outline for manuscript discussing opportunities and barriers to stormwater management using GI to adapt to climate change in U.S. cities. Due 6 weeks after approval of Deliverable 4.3.B.

Deliverable 5.2.B: A first draft manuscript discussing opportunities and barriers to stormwater management using GI to adapt to climate change in U.S. cities submitted to the COR for review and approval. Due 10 weeks after approval of Deliverable 5.1.C.

Deliverable 5.2.C: A second draft manuscript addressing COR comments on the first draft submitted to the COR. Due 4 weeks after receiving COR comments on Deliverable 5.2.B.

SubTask 5.3: Provide electronic files of all model setup, input and simulation output

The Contractor shall provide to the COR electronic copies of all model setup, model input, and simulation output files generated in this project on a memory stick or external hard drive. Files shall be organized in a directory structure approved by the COR.

Deliverable 5.3.A. Electronic copies of all model setup, model input, and simulation output files generated in this project on a memory stick or external hard drive. Due 8 weeks after completion of Deliverable 4.3.B (presentation of model simulation results).

VII. Schedule of Milestones and Deliverables:

Task No.	DELIVERABLE	Schedule
1	1.2.A. Progress reports	Due monthly
1	1.2.B. Other communication	Due upon request by the COR
1	1.3.A. Draft QAPP	Due 2 weeks after award

1.	1.3.B. Final QAPP	Due 1 week after Deliverable 1.3.A
2	2.1.A. Draft white paper on literature review	Due 12 weeks after award
2	2.1.B. Final white paper on literature review	Due 4 weeks after Deliverable 2.1.A
3	3.1.A. Urban archetype options memo	Due 4 weeks after Deliverable 2.1.A
3	3.1.B. Urban archetype draft white paper	Due 2 weeks after Deliverable 3.1.A
3	3.1.C. Urban archetype final white paper	Due 2 weeks after Deliverable 3.1.B.
4	4.1.A. Draft analysis plan	Due 2 weeks after Deliverable 3.1.B
4	4.1.B. Final analysis plan	Due 2 weeks after Deliverable 4.1.A
4	4.2.A. Historical simulation results	Due 8 weeks after Deliverable 4.1.B
4	4.3.A. Future simulation results	Due 8 weeks after Deliverable 4.2.A
4	4.3.B. Presentation on simulation results	Due 4 weeks after Deliverable 4.3.A
5	5.1.A. Outline - Sensitivity manuscript	Due 2 weeks after Deliverable 4.3.A
5	5.1.B. Draft - Sensitivity manuscript	Due 6 weeks after Deliverable 4.3.A
5	5.1.C. Final – Sensitivity manuscript	Due 4 weeks after Deliverable 5.1.B
5	5.2.A. Outline – Mgmt approaches manuscript	Due 6 weeks after Deliverable 4.3.A
5	5.2.B. Draft - Mgmt approaches manuscript	Due 10 weeks after Deliverable 4.3.A
5	5.2.C. Final - Mgmt approaches manuscript	Due 4 weeks after Deliverable 5.2.B
5	5.3.A. Provide model files on hard drive	Due 8 weeks after Deliverable 4.3.B

VIII. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

IX. Conflict of Interest:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

X. Management Controls:

1. The EPA will review and provide comments on the Work Plan and QAPP.
2. The EPA will also review and provide comments on subsequent deliverables.
3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.
4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

The WAM/COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

XI. Notice Regarding Guidance Provided Under This Work Assignment:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 1-14 <input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2014 Base Option Period Number 1								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Literature Review and Modeling								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input checked="" type="checkbox"/> Work Plan Approval		Specify Section and paragraph of Contract SOW Period of Performance From 09/30/2013 To 09/29/2014								
Comments:										
<input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		\$0.00		LOE:		0		
09/30/2012 To 09/29/2014										
This Action:				\$115,600.00				984		
Total:				\$115,600.00				984		
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:		01/02/2014		Cost/Fee:		\$115,600.00		LOE: 984		
Cumulative Approved:				Cost/Fee:		\$115,600.00		LOE: 984		
Work Assignment Manager Name		Thomas Johnson		Branch/Mail Code:						
				Phone Number		703-347-8618				
				FAX Number:						
Project Officer Name		Sharon Boyde		Branch/Mail Code:						
				Phone Number:		703-347-8576				
				FAX Number:		703-374-8696				
Other Agency Official Name				Branch/Mail Code:						
				Phone Number:						
				FAX Number:						
Contracting Official Name		Mark Cranley		Branch/Mail Code:		CP0D				
				Phone Number:		513-487-2351				
				FAX Number:		513-487-2109				

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 1-15 <input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2014 Base Option Period Number 1								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Synthesis and Assessment								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Specify Section and paragraph of Contract SOW 2e Period of Performance From 09/30/2013 To 09/29/2014								
Comments:										
<input type="checkbox"/> Superfund		Accounting and Appropriations Data								
		<input checked="" type="checkbox"/> Non-Superfund								
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:				LOE:				
09/30/2012 To 09/29/2014										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:		Cost/Fee:				LOE:				
Cumulative Approved:		Cost/Fee:				LOE:				
Work Assignment Manager Name Thomas Johnson						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number 703-347-8618				
						FAX Number:				
Project Officer Name Sharon Boyde						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number: 703-347-8576				
						FAX Number: 703-374-8696				
Other Agency Official Name						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number:				
						FAX Number:				
Contracting Official Name Mark Cramley						Branch/Mail Code: CPoD				
_____ (Signature) 01/10/14 (Date)						Phone Number: 513-487-2351				
						FAX Number: 513-487-2109				

**Performance Work Statement
Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 1-15**

I. Title: Synthesis and Assessment of Climate Change Effects on Water Quality and Aquatic Ecosystems

II. Period of Performance: Award through September 29, 2014 (Contract OY-1)

III. Work Assignment Manager:

Thomas Johnson, PhD
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IV. Total Estimated LOE: 1299 hours

V. Introduction:

The EPA Office of Research and Development (ORD) Global Change Research Program (GCRP) works to build the capacity of EPA program and regional offices, water managers, and other decision-makers to assess and respond to global change impacts on water quality and aquatic ecosystems. Research and assessment activities in the GCRP Water Quality focus area broadly support EPA's mission and responsibilities as defined by the Clean Water Act and the Safe Drinking Water Act.

Climate is a key driver of watershed hydrologic and biogeochemical processes that determine water quality and aquatic ecosystem condition. During the last century, much of the U.S. experienced climate change including warming temperatures, increases in precipitation, and increases in the intensity of precipitation events. Changes in climate and hydrology can have direct and indirect effects on water quality. Direct effects include changes in stream temperature and the influence of hydrologic controls

on the movement of sediment, nutrients, toxics, and microbial pathogens into and within water bodies. Indirect effects result from changes in ecosystems, disease/wildfire, land-use practices (e.g., agricultural practices) and include a wide range of cumulative and cascading effects. Altered flow regimes can change the magnitude, frequency, duration, and timing of peak and low-flow conditions, resulting in a range of physical, biological, and water-quality changes. High flows can deliver sediment, nutrients, and pathogens to streams, lakes, and estuaries; low flows can leave aquatic life vulnerable to increased water temperatures and reduced DO. Increased nutrient loads together with increases in water temperatures could also lead to harmful algal blooms and eutrophication. Climate change will also interact with human use and demand for water, water-management infrastructure, and other stressors such as land-use change that influence water quality. Changes in land use and land cover from urban and residential development are known to impact water bodies in urban watersheds. Climate change will interact with land use and other stressors resulting in multiple, cascading, and cumulative effects on water quality and aquatic ecosystems. In many areas, climate change will present an increased risk of water quality impairment and inability to meet water quality regulatory requirements.

A relatively large body of literature exists addressing the potential effects of climate change on water quantity. However, the literature documenting the potential effects of climate change on water quality and aquatic ecosystems as discussed above, assessing critical vulnerabilities, and analyzing adaptation options is relatively scant. EPA is the lead agency responsible for protecting and restoring the nation's waters. An improved understanding of the potential effects of climate change on water quality and aquatic ecosystems, key vulnerabilities, and adaptation options is critical to the long-term success of EPA's National Water Program.

This Work Assignment will provide support for a national-scale synthesis and assessment of climate change effects on water quality and aquatic ecosystems, with particular focus on relevance and implications for EPA's National Water Program. Goals of the report will be to present a comprehensive summary of results from across the nation, to draw synthetic conclusions based on the entire body of results that extend our understanding beyond that provided by individual products, and to identify knowledge gaps and priority research needs necessary to advancing the science to support adaptation and decision making. This will be accomplished through the development of an integrated synthesis and assessment product to be released as an EPA report in 2016. This report may be in pdf format or in a more interactive and modular web format.

The final scope and content of the report will be decided by the Contractor in consultation with the COR and EPA partners including EPA Office of Water (OW) and the Regions. The assessment shall be structured in a way that is responsive to the needs of and most useful to OW and Regions. The EPA GCRP has developed a Draft Report Outline (see Section XII). The draft outline is subject to revision. The assessment will likely include the following topics (topics addressed by EPA's National Water Program):

1. Water quality, including NPDES, TMDL, 319 programs, and Water Quality Standards
2. Watersheds and source water protection
3. Drinking water treatment, including waterborne pathogens and waterborne illnesses
4. Wastewater treatment, including CSO events and exposure to pathogens
5. Urban stormwater, including green infrastructure and low-impact development
6. Agricultural runoff
7. Rivers and streams
8. Lakes

9. Wetlands
10. Estuaries
11. Coral reefs
12. Coasts

Contractor support shall include working with EPA ORD, OW, the Regions, and other project partners to compile, summarize, and synthesize key results from existing literature and new and emerging EPA and EPA funded extramural research addressing climate change, water quality, and aquatic ecosystems. The Contractor will be primary author for selected report chapters and chapter sections, and serve in a supporting role to EPA or partner authors to complete other chapters and chapter sections. Contractor support also shall include the development of conceptual (visual) models, development of topical or place-based case studies, and conducting analyses, preparing graphics and other miscellaneous tasks for inclusion in the report.

VI. Specific Tasks and Deliverables:

Task 1 – Establish Communication, Hold Kick-off Meeting, Prepare Workplan, and Prepare QAPP

SubTask 1.1. Establish communication with the COR and develop a regular reporting schedule

Within 3 days of start date of this WA, the Contractor shall schedule a series of weekly conference calls (not to exceed 1 hour) or at the frequency requested by the COR, with the COR and appropriate contractor staff to clarify outstanding questions and confirm the schedule and specific tasks.

The Contractor shall schedule a kick-off meeting with the WAM and relevant GCRP staff to discuss the outline, assessment content and scope, participants for meetings in Tasks 2 and 3, and background documents available for Tasks 3 and 4.

In collaboration with the COR, the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Work Assignment.

Deliverable 1.1.A: Brief, written progress reports as email to the COR. Due monthly or upon request by the COR for the duration of this Work Assignment.

Deliverable 1.1.B: Kick-off meeting to discuss outline, assessment content and scope, participants for meetings in Tasks 2 and 3, and background documents due within 2 weeks of award.

Deliverable 1.1.C: Project meetings and other communications, such as conference calls, as needed. Due upon request by the COR for the duration of this Work Assignment.

Subtask 1.2 Prepare Work Plan, Staffing Plan, and Quality Assurance Project Plan (QAPP)

The Contractor shall have 15 days to prepare a Technical Work Plan describing how the work outlined in this Performance Work Statement will be performed, including deliverables, a schedule, budget, and level of effort. The Contractor shall also prepare a Staffing Plan, which shall be submitted as part of the

Work Plan that shows assigned personnel by task and the qualifications of the proposed personnel. The Contractor shall provide expertise in the basic science areas required to complete this work assignment.

The contractor shall develop a Quality Assurance Project Plan (QAPP) for this work assignment for COR and Quality Assurance Manager approval. The workplan and QAPP shall be submitted simultaneously for approval. The Contractor must address in the QAPP how they are going to consider the use of existing data to carry out this task. Existing (or secondary) data are defined as environmental or health data that were developed for a different purpose. This includes data used from citations found in the literature. See these documents: "*EPA Quality Manual for Environmental Programs EPA CIO 2105-P-01-0*", <http://www.epa.gov/irmpoli8/policies/2105P010.pdf> and "*EPA Requirements for Quality Assurance Project Plans (QA/R-5)*", <http://www.epa.gov/quality/qs-docs/r5-final.pdf>.

The QAPP shall be submitted simultaneously with the Work Plan for approval. The Contractor shall not perform any work on subsequent tasks under this Work Assignment until the Work Plan and QAPP are reviewed and approved.

Deliverable 1.2.A: A draft workplan submitted to the COR for review. Due 15 days after award.

Deliverable 1.2.B: A final workplan addressing COR comments on the draft submitted to the COR for approval. Due 1 week after receiving COR comments on the draft workplan.

Deliverable 1.2.C: A draft QAPP submitted to the COR for review. Due 15 days after award.

Deliverable 1.2.D: A final QAPP addressing COR comments on the draft submitted to the COR for approval. Due 1 week after receiving COR comments on the draft QAPP.

Task 2 – Engagement with EPA’s Office of Water

EPA GCRP has developed a draft prospectus that provides an overview of the goal of the Assessment, general approach, discusses roles and responsibilities for authors, the review process, communication, and an overall timeline, as well as a draft outline for the Assessment. Engagement with the Office of Water (OW) shall include several meetings, development of graphics and presentation materials, revisions to the draft prospectus and outline, and a memo on key data gaps, research needs and feasible case studies that illustrate topics relevant to EPA OW’s understanding of and response to climate change.

The first OW meeting shall be with key OW managers and senior officials, along with the ORD ACE deputy NPD for climate to present the prospectus and outline. This shall be followed by a kick-off virtual meeting to OW staff representatives from across OW programs to present the overall Assessment. This kick-off meeting shall be followed by meetings (in-person or by phone) with each OW program office and Regional representatives, as appropriate, to elicit feedback on specific content and engage them in case study development and authorship of specific chapters. The Contractors shall document each of these meetings/calls, revise the outline and prospectus in consultation with the WAM and based on feedback from these meetings, and summarize data gaps, key research needs, feasible case studies, and research priorities in a memo. Proposed Contractor revisions to the Draft Outline shall reflect opportunities to improve the scientific and technical merit, relevance of results to EPA OW and the Regions, and/or the efficiency of conducting and presenting the results of any analyses.

Subtask 2.1 Prepare conceptual model of the Assessment structure, matrix of topics to be included, and schedule meeting with OW managers

The Contractor shall develop a simple conceptual model that lays out the report structure based on the draft outline and matrix of topics to be included in the Assessment, discussed in Deliverable 1.1.B. The Contractor shall schedule a meeting with key OW managers and senior officials based on the list of participants developed in Deliverable 1.1.B. The purpose of this meeting is to introduce the Assessment and collect feedback on the outline, as well as identify proposed participants for OW program-level meetings.

Deliverable 2.1.A: Simple conceptual model and matrix of topics due 1 week after Deliverable 1.1.B. Revised conceptual model and matrix due 1 weeks after receipt of COR's comments.

Deliverable 2.1.B: Schedule meeting with key OW managers and senior officials to discuss draft prospectus (revised to include Deliverable 2.1.A) due within 2 months of WA initiation. The Contractor shall provide notes from the meeting to all attendees within 1 week of the meeting.

Deliverable 2.1.C: Revised draft prospectus due 1 week after Deliverable 2.1.B.

Subtask 2.2 Kick-off meeting and programmatic meetings

The Contractor shall develop an agenda and presentation materials for a kick-off meeting (approximately 2 hours) with staff from across OW Programs and the Regions, based on recommendations from Deliverable 2.1.B and Deliverable 2.1.C. The Contractor shall schedule the kick-off meeting and subsequent meetings (potentially up to a half-day each) with OW offices and Regional representatives approximately 1 month after Deliverable 2.1.B. These meetings shall occur within a 2-3 week timeframe and shall include relevant GCRP staff. The kick-off meeting shall serve as an introduction to the overarching goals and structure of the Assessment, while the programmatic meetings shall provide an opportunity to further develop and refine specific sections of the Assessment, discuss potential case studies for inclusion, identify gaps and research needs, and identify staff willing to contribute data, serve as authors, or contribute in other ways to writing the Assessment.

Deliverable 2.2.A: Draft agenda, participant list, and invitation due 1 week after Deliverable 2.1.C. Final products due 1 week after receiving COR's comments.

Deliverable 2.2.B: Schedule kick-off meeting and programmatic meetings within 1 month of Deliverable 2.1.B. Provide notes from the meeting to all attendees within 1 week of the meetings.

Deliverable 2.2.C: Draft presentation for kick-off meeting due 2 weeks before the scheduled meeting (Deliverable 2.2.B). Final presentation revised based on COR's comments due 1 week before meeting and materials (agenda, prospectus) sent to participants.

Subtask 2.3 Memo on research needs and potential case studies

The Contractor shall compile and synthesize outcomes from the meetings in a memo that discusses potentially feasible case studies to include in the Assessment, and identifies key data gaps and research needs with suggested prioritization. In consultation with the COR and GCRP staff, the Contractor shall revise the Draft Assessment outline to incorporate information in this memo, i.e., add the case studies selected for inclusion in each chapter of the Assessment.

The assessment shall be structured in a way that is responsive to the needs of and useful for EPA OW and Regions. Rather than being a traditional, written document, it is anticipated that the Assessment will be published as a web-based product (potentially simply as a pdf or as a more interactive web document). A goal of this approach is to allow readers to access the body of information contained in alternative ways, e.g., cross-cut by topic, by Program, or by Region through hyperlinks and other approaches. In consultation with the COR, the Contractor shall develop a final Assessment outline that is compatible with presentation as a web-based product.

Deliverable 2.3.A: Memo on case studies and research needs due 2 weeks after final programmatic meeting in Subtask 2.2.

Deliverable 2.3.B: Revised draft outline based on discussions with WAM about Deliverable 2.3.A due 2 weeks after receiving comments from COR.

Task 3 – Synthesis of EPA and EPA-sponsored work and meeting with ORD scientists

The Contractor shall produce a synthesis of EPA research and EPA-sponsored academic research (e.g., through NCER STAR grants) for topics listed in Section V or as approved in Deliverable 2.3.B. The synthesis shall cover all relevant work published across EPA (particularly OW, the Regions, and ORD labs) and resulting from STAR grants addressing climate change and water quality or aquatic ecosystems. The COR will provide an initial list of research projects and EPA researchers to the Contractor. Attendees of the meetings under Task 2 and this task likely will suggest additional sources.

The draft synthesis shall be written in a format to be specified by the COR (e.g., ready to be incorporated into the report structure), and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. The Contractor shall prepare a draft synthesis and submit to the COR for review. The Contractor shall revise the draft to address COR comments. Additional sources may be identified during Subtask 2.3 and the virtual meeting with ORD scientists that shall be incorporated into the draft synthesis. A second and final draft shall be submitted to the COR for approval after the virtual meeting (Deliverable 3.D).

The Contractor shall develop the agenda and presentation materials for a virtual meeting with relevant ORD scientists. The Contractor, COR, and GCRP staff shall develop the list of participants jointly. The Contractor shall be responsible for documenting the virtual meeting and facilitating the webinar discussions. The goals of the virtual meeting are to identify any additional pertinent research to include in the Assessment and to identify ORD authors.

Deliverable 3.A: Draft list of relevant research projects due 4 weeks after WA initiation.

Deliverable 3.B: Draft synthesis of research projects due 8 weeks after Deliverable 3.A.

Deliverable 3.C: Draft agenda, invitation, and participant list due 1 week after Deliverable 2.2.B.

Deliverable 3.D: Virtual meeting for ORD scientists due within 1 month of completing Deliverable 2.3.B. Provide notes from the meeting to all attendees within 1 week of the meetings.

Deliverable 3.E: Final synthesis document based on input from Deliverable 3.D due 3 weeks after Deliverable 3.D.

Task 4 - Review and Summarize Peer-Reviewed Scientific Literature Including “Grey” Sources

The contractor shall review and summarize peer-reviewed scientific literature, including “grey” sources, that addresses climate change impacts on and adaptation options for the topics listed in Section V or as approved in Deliverable 2.3.B.

For efficiency the literature review shall start with the most recent major reviews and syntheses in each topic areas (e.g., technical inputs to the National Climate Assessment, USGCRP Synthesis and Assessment Products). The Contractor shall then incorporate new, relevant literature, focusing on the period from 2007 to present. The COR will provide a list of initial documents. Additional literature may be required based on input from meeting participants in Tasks 2 and 3, as well as the revised outline. The contractor shall provide pdf versions (digital) of all relevant literature to the COR.

At a point (to be determined) during this WA potentially after the virtual meeting in Task 3, GCRP staff will engage USGCRP groups by presenting an overview of the Assessment and recruiting potential authors from other agencies. The Contractor shall follow-up with any additional scientists identified through this process to add relevant literature supplied by them to the literature review. The Contractor shall also provide scientists identified through USGCRP with information, as requested, for contributing to the Assessment as an author or co-author.

Deliverable 4.A: Memo with compiled list of literature sources and brief description of relevancy due 6 weeks after WA initiation.

Deliverable 4.B: Draft background sections incorporating the relevant literature from Deliverable 4.A into the draft outline as of Deliverable 2.1.C due 6 weeks after Deliverable 4.A.

Deliverable 4.C: Revised background sections incorporating any new literature and topics identified in Tasks 2 and 3, from other agency authors identified by the WAM, and comments from the WAM due 2 weeks after Deliverable 3.D.

Task 5 – Develop conceptual models/graphics

The Contractor shall develop an overview conceptual model that shows the content and interrelationships among content presented in the full assessment report. This conceptual model shall build on the simple model developed in Task 2. In addition, each Chapter in the Report (as specified in Deliverable 2.3.B; the Final Report Outline) shall have an associated graphic that is tied to the overview conceptual model and highlights in greater detail the main topic discussed in that section. The contractor shall also develop a matrix of topics to be included (climate variables vs. programmatic endpoints, for example) that accompanies the conceptual model and can be used for sections of the report. The matrix may be more detailed for sections than for the introduction of the report and may

serve as entry points into the assessment for different audiences, particularly if the Assessment is predominantly web-based.

Deliverable 5.A: Draft overview conceptual model and draft matrix due 2 weeks after Deliverable 2.3.B.

Deliverable 5.B: Final conceptual model and final matrix based on comments from COR due 2 weeks after Deliverable 5.A.

Deliverable 5.C: Draft graphics for each section due 4 weeks after Deliverable 2.3.B.

Deliverable 5.D: Final graphics for each section based on comments from COR due 4 weeks after Deliverable 5.C.

Task 6 – Write selected draft chapters, sections and case study examples

The Contractor will be primary author for selected report chapters and chapter sections, and serve in a supporting role to EPA or partner authors to complete other chapters and chapter sections. The Contractor shall be primary author for completing drafts of:

- Part 1 (Purpose and Approach)
- Part 2 (Scenarios),
- Introductory text for Parts 3 (Water Quality and Infrastructure) and 4 (Watersheds and Coasts),
- Background sections (literature review and synthesis of EPA work) for all Chapters in the report based on the outline approved in Deliverable 2.3.B.

The Contractor shall also be primary author to develop, in consultation with the COR, a set of brief topical or place-based case study examples for inclusion as text boxes in different chapters of the report.

The draft chapters shall be written in a format to be specified by the COR, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. The Contractor shall prepare a first draft manuscript and submit to the COR for review. The Contractor shall revise the first draft to address COR comments and submit a second and final draft to the COR for approval.

Deliverable 6.A: Draft Parts 1 and 2 due 10 weeks after WA initiation.

Deliverable 6.B: Final Parts 1 and 2 due 2 weeks after receiving comments from COR on Deliverable 6.A.

Deliverable 6.C: Draft introductions to Parts 3 and 4 due 4 weeks after Deliverable 2.3.B.

Deliverable 6.D: Final introductions to Parts 3 and 4 due 2 weeks after receiving comments from WAM on Deliverable 6.C.

Deliverable 6.E: Conference call with COR and relevant GCRP staff to develop case study examples for inclusion in each chapter of the Assessment based on selections in Deliverable 2.3.B due 2 weeks after Deliverable 2.3.A.

Deliverable 6.F: Draft case studies based on Deliverable 6.E due 6 weeks after Deliverable 6.E.

Deliverable 6.G: Zero order draft Assessment incorporating all relevant deliverables and identifying lead authors for remaining sections with annotations that describe text to be incorporated due 2 weeks before the end of Option Year 1.

VII. Schedule of Milestones and Deliverables:

Task No.	DELIVERABLE	Schedule
1	1.1.A. Progress reports	Due monthly
1	1.1.B. Kick-off meeting	2 weeks after award
1	1.1.C. Other communication	Due upon request by the COR
1	1.2.A. Draft workplan	Due 15 days after award
1	1.2.B. Final workplan	Due 1 week after receiving COR comments
1	1.2.C. Draft QAPP	Due 15 days after award
1	1.2.D. Final QAPP	Due 1 week after receiving COR comments
2	2.1.A. Simple conceptual model and matrix	Due 1 week after Deliverable 1.1.B; final 1 week after receiving COR comments
2	2.1.B. OW managers meeting	Due within 2 months of WA award
2	2.1.C. Revised prospectus	Due 1 week after Deliverable 2.1.B
2	2.2.A. Draft agenda, participants, invitation	Due 1 weeks after Deliverable 2.1.D; final due 1 week after receiving COR comments
2	2.2.B. OW kick-off meeting, program meetings	Due within 1 month of Deliverable 2.1.B
2	2.2.C. Draft presentation	Due 2 weeks before scheduled kick-off meeting (Deliverable 2.2.B); final presentation 1 week before meeting
2	2.3.A. Memo on case studies and research needs	Due 2 weeks after final Deliverable 2.2.B meeting
2	2.3.B. Revised outline	Due 2 weeks after receiving COR comments on Deliverable 2.3.A
3	3.A. Draft project list	Due 4 weeks after award
3	3.B. Draft synthesis of research	Due 8 weeks after Deliverable 3.A
3	3.C. Draft agenda, invitation, participants	Due 1 week after Deliverable 2.2.B
3	3.D. ORD virtual meeting	Due within 1 month of Deliverable 2.3.B
3	3.E. Final synthesis	Due 3 weeks after Deliverable 3.D
4	4.A. Lit sources memo	Due 6 weeks after award

4	4.B. Draft background sections	Due 6 weeks after Deliverable 4.A
4	4.C. Revised background sections	Due 2 weeks after Deliverable 3.D
5	5.A. Draft conceptual model and matrix	Due 2 weeks after Deliverable 2.3.B
5	5.B. Final conceptual model and matrix	Due 2 weeks after receiving comments from COR on Deliverable 5.A
5	5.C. Draft graphics for sections	Due 4 weeks after Deliverable 2.3.B
5	5.D. Final graphics for sections	Due 4 weeks after receiving comments from COR on Deliverable 5.C
6	6.A. Draft Sections 1 and 2	Due 10 weeks after award
6	6.B. Final Sections 1 and 2	Due 2 weeks after receiving COR comments on Deliverable 6.A
6	6.C. Draft introductions to Sections 3 and 4	Due 4 weeks after Deliverable 2.3.B
6	6.D. Final introductions to Sections 3 and 4	Due 2 weeks after receiving COR comments on Deliverable 6.C
6	6.E. Call to develop case studies	Due 2 weeks after Deliverable 2.3.A
6	6.F. Draft case studies	Due 6 weeks after Deliverable 6.E
6	6.G. Zero order draft Assessment	Due 2 weeks before end of Option Year 1

VIII. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

IX. Conflict of Interest:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or

potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

X. Management Controls:

1. The EPA will review and provide comments on the Work Plan and QAPP.
2. The EPA will also review and provide comments on subsequent deliverables.
3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.
4. Technical Direction: The COR is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the COR within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

The COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the COR in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

XI. Notice Regarding Guidance Provided Under This Work Assignment:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

XII. Draft Assessment Outline

Abstract

Preface/Motivation for the Report

Executive Summary

Part 1. Purpose and Scope

Overview

1. EPA programs to protect water quality
2. Potential for climate change to affect attainment of water quality goals
 - Use decision inventory matrix to help frame discussion (Table with “Precipitation, Temperature, Flow” as columns, “Water Issues/Programs” as rows.; 2nd table with Regions as columns, rows are water issues of concern based on Regional Implementation Plans); also need top-level conceptual model
 - Note: need to ensure capture regional concerns
 - Different programs at different stages of development (in terms of CWA implementation)
 - Want to use to prepare programs for climate change effects, especially those that are less well established, e.g., eco
3. Office of Water Strategy, President’s Climate Change Action Plan
4. Approach/Philosophy
 - 4.1. Focus on decisions being made to protect water quality
 - 4.2. Vulnerability Assessment key component
 - 4.2.1. Methods (including expert elicitation, visual displays, etc.)
 - 4.3. Methods to estimate impacts
 - 4.4. Robust Decision Making and other non-probabilistic approaches
 - 4.5. Indicators and monitoring change
 - 4.6. Limitations/knowledge gaps

Part 2. Scenarios

5. Background
 - 5.1. What are the drivers (need to keep brief since don’t want to get to far from water)
 - Add conceptual model
 - Tie into our approach through discussion of drivers, sensitivity analysis, impacts, then scenarios
 - Results in profound uncertainty – unlikely to be resolved anytime soon.
 - 5.2. Why are scenarios needed, how should then be interpreted, look at IPCC 2nd assessment definitions
 - 5.2.1. Ensemble approach (to address profound uncertainty)
6. Types of scenarios
 - 6.1. Modeled
 - 6.1.1. Statistically downscaled
 - 6.1.2. Mechanistically downscaled
 - 6.2. Historical/spatial analogs
 - 6.3. Sensitivity analyses
7. Climate Scenarios
8. Human population (size, demographics, distribution on the landscape)
9. Housing density and impervious surface

10. Hydrologic
11. Limitations/knowledge gaps

Note: For Chapters 5-8, will need maps/graphs.

Note: For Parts 3 and 4, need overview graphic and “stepped-down” table similar to Purpose and Scope.

Note: Each chapter will contain at a minimum: 1) a literature review (using secondary sources if literature is large), 2) a synthesis of EPA work that advances our understanding of the issues, and 3) identification of key limitations/knowledge gaps.

Note: Where there are interesting “stories”, will call out in text boxes.

Note: Depending on OW response/state of science/resources available, chapters will go beyond this minimum to include: 4) adaptation responses (case studies specific to topic), and 5) an assessment/interpretation of what this all means for water quality managers (EPA, State, Local). We may need to prioritize how many of these “end to end” assessments are done.

Part 3. Water Quality and Infrastructure

Overview

9. Source water protection – Shout forward to Watersheds -- will need to ensure good coordination with Part 4. Watersheds to reduce confusion.
10. Drinking water treatment
 - Include drinking water contamination by waterborne pathogens, e.g., *Campylobacter*, *Cryptosporidium*, *Giardia*, and *E. Coli*
 - Include Vulnerable populations and waterborne illnesses
 - May want to include water use efficiency since OW does this
11. Wastewater treatment
 - Include increases in exposure to waterborne pathogens due to CSO events
12. Urban runoff (stormwater)
 - May be chapter where we can go further since OW has strategic actions that emphasize sustainability, voluntary actions, life cycle analysis
13. Agriculture runoff
 - Include exposure to microbial contamination from non-point sources.

Part 4. Watersheds and Coasts

Overview

- Include OW’s Healthy Watersheds
 - OW strategy intended to meet CWA101(a) objective “...to restore and maintain chemical, physical, and biological integrity...” as part of resiliency
 - IWRM
 - Shout back to Source Water Protection Chap. 9
14. Rivers and Streams
 15. Lakes
 16. Wetlands
 - CWA 404 programs (to include wetland and stream compensation projects)
 - Improve baseline information on wetlands to inform effective adaptation to climate change
 17. Estuaries
 18. Coral Reefs
 19. Other Coastal?

Part 5. Cross-cutting issues

Overview

20. Energy-water nexus

20.1. Energy generation (effects of climate on water characteristics and implications for energy reliability)

20.2. Mitigation efforts and impacts on water quality

20.2.1. Energy conservation

20.2.2. Biofuels

20.2.3. Co-benefits of GHG controls

20.3. Water adaptation and energy impacts

- To include water conservation and efficiency

21. Biogeochemical cycles

22. Limitations/knowledge gaps

Part 6. Synthesis and conclusions (including overall summary of knowledge gaps)

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 1-15 <input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060	Contract Period 09/30/2012 To 09/29/2014 Base Option Period Number 1	Title of Work Assignment/SF Site Name Synthesis and Assessment								
Contractor TETRA TECH, INC.		Specify Section and paragraph of Contract SOW 2e								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Period of Performance From 09/30/2013 To 09/29/2014								
Comments:										
<input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:				LOE:				
09/30/2012 To 09/29/2014										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:		Cost/Fee:				LOE:				
Cumulative Approved:		Cost/Fee:				LOE:				
Work Assignment Manager Name Thomas Johnson						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number 703-347-8618				
						FAX Number:				
Project Officer Name Sharon Boyde						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number: 703-347-8576				
						FAX Number: 703-374-8696				
Other Agency Official Name						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number:				
						FAX Number:				
Contracting Official Name Mark Cranley						Branch/Mail Code: CPOD				
_____ (Signature) 03/05/14 (Date)						Phone Number: 513 487-2351				
						FAX Number: 513-487-2109				

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 1-16	
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2014 Base Option Period Number 1	
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Regional Indicator Development	
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Specify Section and paragraph of Contract SOW 2h Period of Performance From 09/30/2013 To 09/29/2014	
Comments: Please provide a WP and Cost Proposal NLT 03/10/2014.			
<input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund			
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.			
SFO (Max 2) <input type="checkbox"/>			
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)
1			
2			
3			
4			
5			
Authorized Work Assignment Ceiling			
Contract Period: 09/30/2012 To 09/29/2014		Cost/Fee: LOE:	
This Action:			
Total:			
Work Plan / Cost Estimate Approvals			
Contractor WP Dated:		Cost/Fee: LOE:	
Cumulative Approved:		Cost/Fee: LOE:	
Work Assignment Manager Name Laurie Alexander		Branch/Mail Code:	
(Signature) _____ (Date) _____		Phone Number 703-347-8630	
		FAX Number:	
Project Officer Name Sharon Boyde		Branch/Mail Code:	
(Signature) _____ (Date) _____		Phone Number: 703-347-8576	
		FAX Number: 703-374-8696	
Other Agency Official Name		Branch/Mail Code:	
(Signature) _____ (Date) _____		Phone Number:	
		FAX Number:	
Contracting Official Name Mark Cranley		Branch/Mail Code: CPOD	
(Signature) <i>Mark Cranley</i> (Date) 02/21/14		Phone Number: 513-487-2351	
		FAX Number: 513-487-2109	

Performance Work Statement

Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment 1-16

TITLE: Technical Workshops for Regional Indicator Development

PERIOD OF PERFORMANCE: Award date through September 29, 2014

WORK ASSIGNMENT MANAGER: Laurie Alexander
U.S. Environmental Protection Agency
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ALTERNATE WAM : Jason Todd
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INTRODUCTION

EPA's Office of Research and Development (ORD), in collaboration with the Office of Water (OW), is developing regional indicators for assessing the extent and function of physical, chemical, and biological connections by which headwater resources, including small streams, temporary wetlands and open waters, affect the integrity of downstream waters. As part of this research, EPA is initiating a series of technical workshops to identify candidate indicators of stream-wetland connectivity.

OBJECTIVES

The Contractor shall provide technical support by performing the following tasks for one workshop: (1) pre-workshop planning and organization, (2) participant recruitment,

coordination, and reimbursement, (3) workshop facilitation and recording, (4) post-workshop report, and (5) follow-up teleconference and webinar with workshop participants. The workshop will be held at the Joint Aquatic Sciences Meeting (JASM) in Portland, OR in May 2014. For planning purposes, the number of workshop participants (excluding EPA and Contractor staff) is anticipated to be 15 people. There will be 6 participants from EPA.

Workshop participants will collaborate to (1) identify candidate indicators of stream-wetland connectivity, and (2) discuss research approaches for field test and validation of the proposed indicators. Contractor support shall include development of workshop objectives and materials, facilitation of workshop discussions, and post-workshop analysis. In order to carry out this task, the Contractor and participants shall have demonstrated expertise in one or more relevant fields of aquatic science, including surface water or groundwater hydrology, stream or wetland ecology, freshwater biology, nutrient biogeochemistry, numerical or mechanistic modeling, wetland soils science, landscape/watershed ecology, or geospatial analysis. Participants can scientists from government, consulting firms, NGOs, and academia.

SPECIFIC TASKS:

Task 1: Prepare Work Plan and Cost Estimate

The Contractor shall prepare a work plan in response to this work assignment, outlining the proposed approach, staff technical expertise, number of hours at each staff level, and a schedule. The work plan should identify potential data, tools, or other resources needed and any potential problems that might be encountered during the execution of the work assignment. This task also includes a bi-weekly telephone conference between the WAM and project manager, each approximating 1 hour in duration, to coordinate and confirm task performance.

Deliverable 1: Work Plan and Cost Proposal

Due: 15 days after receipt

Task 2: Kick-off call

Within seven days after work plan approval, the Contractor shall schedule a conference call, not to exceed 2 hours, with the EPA Work Assignment Manager (WAM) and appropriate Contractor staff to clarify the work assignment objectives and to schedule subsequent planning calls.

Deliverable 2: Kick-off Call

Due: within 7 days of work plan approval

Task 3: Pre-workshop planning and organization

The Contractor, in consultation with the WAM, shall perform pre-workshop planning to design and organize the workshop, including selection of meeting date(s), discussion of workshop topics, objectives and desired outcomes, suggestions for and recruitment of workshop participants, development of draft agenda, plans for facilitation, options for meals or refreshments, emails announcing the meeting purpose, location, and date(s), and preparation of workshop materials and handouts. The Contractor shall arrange for a meeting room for 25-30 people, with tables, chairs, internet access, and audio/video support, including a projector, projector screen, easel pads/easels, and markers.

Deliverable 3a: Workshop plan for WAM approval, with:

- Proposed participants;
- Objectives and desired outcomes;
- Outline or bullet-points describing facilitation approach
-

Due: No later than 15 days after workshop date is set

Deliverable 3b: Draft workshop materials and handouts

Due: No later than 45 days before the workshop date

Task 4: Participant recruitment and coordination

The Contractor shall acquire and maintain contact information for workshop participants, including names, addresses, affiliations, emails, phone numbers, and research interests or areas of expertise. The Contractor is responsible for corresponding with candidate participants, including sending invitations, confirming participation (or unavailability), and coordinating lodging and travel arrangements, if any, for the workshop.

Deliverable 4a: Document of contact information

Due: No later than 7 days following Deliverable 3a

Deliverable 4b: E-mail announcement/invitations sent

Due: No later than 10 days following Deliverable 4a

Deliverable 4c: Participation (or unavailability) confirmed, lodging and travel arrangements, if any, complete .

Due: No later than 21 days before the workshop date

Task 5: Workshop facilitation and recording

The Contractor shall conduct and facilitate the workshop according to the approach agreed on in task 3a. The Contractor shall provide at least one experienced facilitator, and at least one recorder (not the facilitator), for the workshop.

The recorder can assign additional recorders as needed for any break-out group sessions. The Contractor is responsible for developing a facilitation approach, and for supplies or devices needed for recording results.

Deliverable 5a: Conduct and facilitate the workshop

Due: During workshop

Deliverable 5b: Document/record workshop discussion, findings, results in real-time

Due: During workshop

Task 6: Post-workshop reporting

For the workshop, the Contractor shall compile workshop proceedings and results, which shall be reviewed by the WAM and then distributed to workshop participants for comment.

Deliverable 6: Summary of workshop findings delivered, including:

- Workshop objectives, agenda, participants, break-out sessions, if any
- Results, including the list of candidate indicators
- Discussion of the values and functions of each proposed indicator
- Approaches for test and validation of proposed indicators

Due: No later than 45 days following workshop completion

Task 6: Follow-up teleconference

Following delivery of the post-workshop report, the Contractor shall schedule and facilitate a follow-up teleconference with workshop participants.

Deliverable 6: Notes from teleconference

Due: No later than 60 days after completion of task 6

SCHEDULE OF DELIVERABLES:

Task # and Deliverable	Deliverable description	Due Date
1	Work Plan and Budget delivered	15 days after receipt
2	Kick-off call and schedule for future calls complete	Within 7 days of work plan approval
Task 3 - Pre-workshop planning and organization		
3a	Workshop plan for WAM approval, with: - Candidate participants; - Objectives and desired outcomes; - Facilitation approach	No later than 15 days after workshop date is set
3b	Draft workshop materials and handouts	No later than 45 days before the workshop date
Task 4 - Participant recruitment and coordination		
4a	Document of contact information	No later than 7 days following approval of Deliverable 3b
4b	E-mail announcement/invitations sent	No later than 10 days following Deliverable 4a
4c	Participation (or unavailability) confirmed, lodging and travel arrangements, if any, complete	No later than 21 days before the workshop date
Task 5: Workshop facilitation and recording		
5a	Conduct and facilitate the workshop	During workshop
5b	Document/record workshop discussion, findings, results in real-time	During workshop
Task 6: Post-workshop reporting		
6	Summary of workshop findings, including: - Workshop objectives, agenda, participants, break-out sessions, if any - List of candidate indicators - Approaches for test and validation of proposed indicators	No later than 45 days following workshop completion
Task 7: Follow-up teleconference		
7	Notes from teleconference	No later than 60 days following completion of task 6

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 1-16 <input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2014 Base Option Period Number 1								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Technical Workshops for Region								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input checked="" type="checkbox"/> Work Plan Approval		Period of Performance From 09/30/2013 To 09/29/2014								
Comments:										
<input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		\$0.00		LOE:		0		
09/30/2012 To 09/29/2014										
This Action:				\$42,796.00				396		
Total:				\$39,430.00				396		
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:		03/10/2014		Cost/Fee:		\$42,796.00		LOE: 396		
Cumulative Approved:				Cost/Fee:		\$39,430.00		LOE: 396		
Work Assignment Manager Name Laurie Alexander						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number 703-347-8630				
						FAX Number:				
Project Officer Name Sharon Boyde						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number: 703-347-8576				
						FAX Number: 703-374-8696				
Other Agency Official Name						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number:				
						FAX Number:				
Contracting Official Name Mark Cranley						Branch/Mail Code: CP0D				
_____ (Signature) 04/23/14 (Date)						Phone Number: 513-487-2351				
						FAX Number: 513-487-2109				

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 1-17 <input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060	Contract Period 09/30/2012 To 09/29/2014 Base Option Period Number 1	Title of Work Assignment/SF Site Name Modeling Hydrology								
Contractor TETRA TECH, INC.		Specify Section and paragraph of Contract SOW 2c								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Period of Performance From 09/30/2013 To 09/29/2014								
Comments:										
<input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
SFO <input type="checkbox"/> (Max 2) Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		LOE:						
09/30/2012 To 09/29/2014										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:				Cost/Fee:				LOE:		
Cumulative Approved:				Cost/Fee:				LOE:		
Work Assignment Manager Name Tim Canfield <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>							Branch/Mail Code: Phone Number 580-436-8535 FAX Number:			
Project Officer Name Sharon Boyde <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>							Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696			
Other Agency Official Name <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>							Branch/Mail Code: Phone Number: FAX Number:			
Contracting Official Name Mark Cranley <div style="display: flex; justify-content: space-between;"> <div> (Signature) </div> <div>03/26/14 (Date)</div> </div>							Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109			

STATEMENT OF WORK
CONTRACT NUMBER: EP-C-12-060
WORK ASSIGNMENT NUMBER 1-17

TITLE: Modeling hydrology and water quality in predominant agricultural regions with emphasis on the Big Spring Run watershed in Lancaster, PA.

WORK ASSIGNMENT COR

Timothy J. Canfield
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PERIOD OF PERFORMANCE

Work Assignment initiation through September 29, 2014

INTRODUCTION & BACKGROUND

The Conestoga watershed contributes a significant amount of water and sediment annually to the Chesapeake Bay, a water body that has been listed as impaired under the Clean Water Act since 1998. The water quality concerns for the Chesapeake Bay has attracted federal, state, environmentalists, academics and others to the area to employ their expertise for developing and evaluating mitigation strategies for improving and sustaining the improvement of water quality in the Bay. The work is scattered throughout the watershed and involves everything from management, vegetative, and structural Best Management Practices (BMPs). One research project geared at evaluating a stream restoration effort that employs both the vegetative and structural aspect for reducing stream sediment loss and improving water quality within the Conestoga watershed has gotten national attention because it involves a comprehensive approach to evaluating stream restoration. The study sites includes Big Spring Run (BSR) in Lancaster, PA, which is being evaluated for the effect of the BMP on ground water and surface water quality and quantity, nutrient transport and speciation, biological impacts, physical and mechanistic dynamics of the systems.

The State of Pennsylvania through its commitment to the Chesapeake Bay council set milestones in 2012 to reduce nitrogen, phosphorus and sediment loads to the Chesapeake Bay by approximately; 6.3 million, 0.2 million, and 204 million pounds respectively in the year 2013 (PDEP, 2012). The research at BSR was initiated for conducting pre and post BMP implementation or (stream restoration) evaluations including hydrology, ecological functions, and nutrient dynamics. The site was the location of an historic milldam. Milldams were used between 1600s and 1900s for power generation and occurred in the highest densities along eastern streams within the states of Maryland, Pennsylvania, New York and central New England and are believed to have resulted in the settlement of fine sediment over resettlement wetlands (Walter and Merritts, 2008). These legacy sediments are highly erodible and can cause between 50 to 80 percent of suspended sediment loads in watersheds in Pennsylvania and Maryland (Walter et al., 2007). The work being conducted at BSR will hopefully give needed information on the effectiveness of the BMP for improving water quality and reducing sediment loads. Work done at BSR will contribute significantly our understanding of the efficacy of structural BMPs. The capability for modeling the study conceptually and showing how restoration could impact sediment delivery and hydrology at a watershed scale could provide useful information for conservation practitioners and others.

Modeling watersheds as an approach for evaluating the impact of BMP implementation has become increasingly relevant due limitations for conducting long-term extensive monitoring. Watershed scale models have been applied to evaluate various aspects of non-point source pollution and to a lesser extent impacts of structural BMPs. Field evaluation of structural BMPs at this scale can be extremely costly. Though watershed models cannot account for every detail, they are a good source for evaluating the targeted systems at work and the dynamics between and

within those systems.

The Soil and Water Assessment Tool (SWAT) was developed by the United States Department of Agriculture (USDA), the Agricultural Research Service (ARS) for conducting long-term, continuous, watershed level simulations used for predicting the impact of land management practices on water quality and quantity for variety of soils, land cover and management practices (Arnold et al., 1998). SWAT is a physically based model with the capability for efficiently simulating high levels of spatial detail and requires input of weather, hydrology, soil properties, vegetation, and land management practices (Jha, et al., 2007). SWAT has been tested extensively across the US and internationally for evaluating non-point source pollution, conservation practices, and land use management among others. The model has also been used for watershed studies within the Chesapeake Bay area (Chu et al., 2004; Meng et al., 2010; Sexton et al., 2010; Veith et al., 2010) for evaluating water quality and quantity concerns, and is part the Chesapeake Bay Forecast System (CBFS) being developed by the University Of Maryland at College Park and the National Oceanic and Atmospheric Administration (NOAA) to provide real time simulations of the Bay (Meng et al., 2010).

Hydrology in SWAT is based on a water balance that includes surface runoff, precipitation, percolation, lateral subsurface flow, groundwater return flow, evapotranspiration, and channel transmission loss subroutines. Surface runoff is estimated based on land use, antecedent moisture conditions and soil type using the SCS curve number method (Neitsch, et al., 2011); another option is using the Green-Ampt (Green and Ampt, 1991) for estimating surface runoff and infiltration, however this method requires sub daily weather data.

SWAT transports sediment through a land component and a channel component (Neitsch, et al., 2011). Within the land component the model estimates soil erosion and sediment from hill slope erosion using the Modified Universal Soil Loss Equation (MUSLE) (Williams, 1975; Williams and Berndt, 1977) and transport sediments based on particle size distributions and routes them through surface water sources and channels (Neitsch et al., 2011). Channel sediment routing includes within stream depositional and degradation processes that are dependent on stream power, channel surface exposure and channel bank and bed composition (Neitsch et al., 2011); that are determined using the modification of Bagnold's sediment transport equation (Bagnold, 1977) and Stokes's law (Chow et al., 1988) to estimates transport concentration capacity as a function of flow velocity.

PROJECT OBJECTIVES

For this WA, the contractor shall provide GIS and modeling support for developing ground water models as part of a project on Big Spring Run in Lancaster County Pennsylvania. This effort will be used to evaluate hydrology and produce ground water flow models useful in describing the effects of restoration at multiple spatial scales.

Ground water and surface water hydrology are critical components of an ecosystem's services and functions, and the fate and transport of environmental stressors through these hydrologic pathways are of vital importance to scientists, regulatory bodies and policy makers. Accordingly, there is an increasing need for all-inclusive studies that capture multiple aspects of ecological problems; for example flow patterns and stressor pathways. The quantity and quality of data needed to characterize all aspects of transport pathways for a specific stressor is time and cost prohibitive. The main objective of this study is to apply and test SWAT for estimating the changes in sediment loads and discharge for post-restoration scenario in the BSR watershed. The objectives of this proposed research are: (a) to parameterize and calibrate ground water and surface water hydrology models for describing the fate and transport of targeted aquatic stressors, especially nitrogen, at varying spatial scales and (b) the calibrated model(s) will then be used to predict the effect of legacy sediment removal on hydrology at BSR and the subsequent effect on nitrogen flux in the BSR watershed.

TASK DESCRIPTION OBJECTIVES

- To evaluate existing data and information form previous contract support to determine where the

current progress of the projects stands in relation to the subsequent tasks listed below.

- GIS support for the creation, manipulation or calculations involving the use of GIS data sources such as LIDAR data, land use data, soil, and other spatially referenced data as needed
- Programming support for modeling efforts that may include, changes in spatial scales, model modifications, and post processing executions
- Parameterize SWAT for BSR watershed and then apply model for simulating the effects of legacy sediment - stream restoration efforts within the watershed. Model application should meet QA standards (G-17184)
- Provide a comprehensive written final report of modeling results and GIS developed from the project data to be delivered to EPA WAM and Task Lead.

QUALITY ASSURANCE

This work will be done in accordance with a Quality Assurance Project Plan (QAPP) submitted by the contractor and approved by the EPA in response to this work assignment. The QAPP will include requirements for data quality. A copy of GWERD QAPP will be provided to the contractor as reference material for the development of the contractor QAPP.

TASK 1: Prepare work plan, cost estimate, quality assurance project plan, & biweekly reports

Sub-Task 1.1 – Prepare work plan, cost estimate & biweekly report schedule

The contractor shall prepare and submit a work plan and a cost estimate in response to this work assignment. This work effort will require expertise in GIS, modeling proficiency using SWAT, HEC-RAS, MODFLOW, and APEX, and familiarity with EndNote, Microsoft Access, Microsoft Excel. The ability to analyze existing data in addition to searching, understanding, and effectively formulating scientific literature are necessary for this work effort.. The contractor should examine the proposed timeline for this Work Effort (Attachment 1) when developing the work plan. The contractor also shall prepare and provide bi-weekly updates as necessary (typically no more than 1 page detailing progress on work assignment tasks. A current copy of the EndNote Data Base will be provided to the EPA WAM and Task Lead at the time of the first bi-weekly update where the file is created and then subsequently when requested by the PI. These reports will be presented at the biweekly update calls that will be scheduled for the duration of this project. Prior to the call a brief communication will be had between the EPA WAM and Task Lead and the contractor lead person to determine if the update call is necessary. If it is determined that no call is necessary then a subsequent call will be scheduled for the following week. No more than three weeks should pass before an update meeting is conducted. Typical call lengths will be 30-60 minutes.

Sub-Task 1.2 –Prepare Quality Assurance Project Plan

The contractor shall prepare a Quality Assurance Project Plan (QAPP) in response to this work assignment within 15 calendar days of receiving this SOW. The contractor QAPP shall address the modeling approach selected to complete the task based on the EPA QAPP provided by the EPA WAM and Task Lead to be used as a point of reference for development of the contractor QAPP. The contractor QAPP should include requirements for independent entry and reconciliation of information collected from 10% of the papers reviewed and data sources utilized to provide accuracy of data input is documented. The QAPP shall be written in accordance with U.S. EPA standards and the NRMRL QMP requirements for Research Model Development and Application Projects. (Requirements will be provided). Contractor will provide a copy of the QAPP to the WAM and Task Lead in electronic form, when the WP and cost estimate are submitted. The QAPP will be reviewed by the EPA Task Lead, EPA WAM, and QA Manager with final approval by the EPA Task Lead, the Task Lead's supervisor, and the EPA QA Manager. The contractor shall respond to the review comments with a revised QAPP. Work shall not commence until the QAPP is approved by the EPA.

TASK 2: Review existing data and information provided by EPA to determine current state of the project effort.

Kick-off Conference Call

The contractor and EPA WAM, Task Lead, and an EPA modeler will engage in an initial phone call to discuss and clarify the tasks of the SOW. A discussion of each task will be had and any initial questions that the contractor may have will be addressed. This WA shall utilize work conducted by a previous contractor. Discussion regarding the current state of the information that was provided by a previous contractor will be conducted. Questions regarding the development of the Endnote database will be discussed. The list of deliverables will be discussed and any questions or initial modifications to delivery schedule of these deliverables will be discussed and agreed upon. Finally a discussion of the communication of milestones and deliverables (both written (word document) and via conference call) will be discussed and a final schedule will be developed and agreed upon.

Communication: The contractor shall provide written (word document) and oral reports (via conference call) to the EPA Task Lead(TL), EPA WAM, and Contractor WAM, on all communication regarding the project progression and any items deemed pertinent with the progression of developing the Endnote files, the model usage and development, status of existing data provided by EPA and the Summary Report.

Deliverables: The contractor shall produce deliverables according to the agreed upon time line as appropriate. The EPA will review these deliverables in a timely manner to provide feedback as appropriate to the contractor in collaboration with the EPA WAM.

TASK 3 – GIS support for the creation, manipulation or calculations involving the use of GIS data sources such as LIDAR data, land use data, soil and other spatially references data as needed

The Contractor shall review the GIS data and the work previously accomplished by the previous contract effort to determine what exists for GIS data and spatially referenced maps. The contractor will start the review of relevant literature provided by the EPA to become familiar with literature that is pertinent to the project study site. As additional literature is found by the contractor it will be incorporated into the Project Endnote file with an attached PDF copy of the project attached to the reference.

TASK 4 – Programming support for modeling efforts that may include changes in spatial scales, model modifications and post processing executions.

The Contractor shall start the process of becoming familiar with the models that will be used for this effort. Existing data will be evaluated to determine if sufficient data is available to start modeling of the Big Spring Watershed

TASK 5: Parameterize SWAT for the Big Spring Run watershed and then apply the model for simulating the effects of legacy sediment – stream restoration efforts within the watershed. Model Application should meet QA standards in the contractor QAPP and in the EPA reference QAPP.

The contractor shall utilize to the extent possible the existing data provided by EPA to develop these model runs. If additional data is needed then contractor will look to incorporate such data as needed. As part of this effort the contractor will be required to develop: 1: A preliminary calibration and validation of the model results; 2: A sensitivity analysis of the model; 3: and an application of the model for simulating potential restoration effects first in the Big Spring Run watershed and second in other similar watersheds with legacy sediments. This effort will involve programming within the ArcGIS environment for exacting changes to LIDAR for representing post restoration changes. Detailed documentation of all aspects of modeling work should be kept and submitted with all electronic files at the completion of the work. Files of all tables and graphs will be supplied to the EPA Task Lead and EPA WAM in the original format that they were developed as well as in the summary report.

TASK 6: Summary of findings from the SWAT model runs regarding the effects of the restoration on the hydrology of Big Spring Run in Lancaster County PA.

The contractor shall provide a written summary of the results of the SWAT modeling for the Big Spring Run watershed. Data tables with the pertinent information for these watersheds will be developed and presented in the summary report. Files of all tables and graphs will be supplied to the EPA Task Lead and EPA WAM in the original format that they were developed as well as in the summary report.

Attachment 1: Proposed timeline for this Work Effort

TASK	SUB-TASK	MILESTONE	TIMELINE
1	1.1	Prepare work plan, cost estimate & biweekly report schedule	Work Assignment issuance
1	1.2	Prepare Quality Assurance Project Plan	Work Assignment issuance
2		Kick-off Conference Call. Review existing data and information provided by EPA to determine current state of the project effort	By April 4, 2014
3		GIS support for the creation, manipulation or calculations involving the use of GIS data sources such as LIDAR data, land use data, soil and other spatially references data as needed	By May 7, 2014.
4		Programming support for modeling efforts that may include changes in spatial scales, model modifications and post processing executions.	By May 29, 2014
5		Parameterize SWAT for the Big Spring Run watershed and then apply the model for simulating the effects of legacy sediment – stream restoration efforts within the watershed. Model Application should meet QA standards in the contractor QAPP and in the EPA reference QAPP.	By June 27, 2014
6		A comprehensive written report with respect to findings from the SWAT model runs identifying the effects of the restoration on the hydrology of Big Spring Run	By July 30, 2014

References

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- Williams, J. R. (1975). SEDIMENT ROUTING FOR AGRICULTURAL WATERSHEDS1. *JAWRA Journal of the American Water Resources Association*, 11(5), 965-974.
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EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 1-17								
		<input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2014 Base Option Period Number 1								
Contractor TETRA TECH, INC.		Title of Work Assignment/SF Site Name Modeling Hydrology and water q								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input checked="" type="checkbox"/> Work Plan Approval		Period of Performance From 09/30/2013 To 09/29/2014								
Comments:										
<input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee: \$0.00				LOE: 0				
09/30/2012 To 09/29/2014										
This Action:		\$75,117.00				750				
Total:		\$75,117.00				750				
Work Plan / Cost Estimate Approvals										
Contractor WP Dated: 06/06/2014		Cost/Fee: \$75,117.00				LOE: 750				
Cumulative Approved:		Cost/Fee: \$75,117.00				LOE: 750				
Work Assignment Manager Name Tim Canfield						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number 580-436-8535				
						FAX Number:				
Project Officer Name Sharon Boyde						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number: 703-347-8576				
						FAX Number: 703-374-8696				
Other Agency Official Name						Branch/Mail Code:				
_____ (Signature) (Date)						Phone Number:				
						FAX Number:				
Contracting Official Name Mark Cranley						Branch/Mail Code: CPOD				
_____ (Signature) 07/10/14 (Date)						Phone Number: 513-487-2351				
						FAX Number: 513-487-2109				